Programmatic Authorization for Caltrans' Routine Maintenance and Repair Activities in Districts 1, 2, and 4

NMFS Programmatic Biological Assessment

October 2010

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List of Abbreviated Terms

ABMP	additional best management practice
BMP	best management practice
BO	biological opinion
CA	covered activity
CAL FIRE	California Department of Forestry and Fire Protection
Caltrans	California Department of Transportation
CESA	California Endangered Species Act
CFGC	California Fish and Game Code
CFPR	California Forest Practice Rule
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
CSBOFFP	California State Board of Forestry and Fire Protection
CWA	federal Clean Water Act
dbh	diameter at breast height
DFG	California Department of Fish and Game
DPS	Distinct Population Segment
ESA	federal Endangered Species Act
ESU	Evolutionarily Significant Unit
FHWA	Federal Highway Administration
FR	Federal Register
HAS	Hydrologic Subarea
HCP	habitat conservation plan
HDPE	high-density polyethylene
ITP	incidental take permit
IWC	International Whaling Commission
LTAA	May Affect, Likely to Adversely Affect
MHHW	mean higher high water
milligrams per liter	mg/L
MMBF	million board feet
NE	No Effect
NEPA	National Environmental Policy Act
NFH	National Fish Hatchery
NLTAA	May Affect, Not Likely to Adversely Affect
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Units

OHWL	ordinary high water level
OHWM	ordinary high water mark
PAH	polycyclic aromatic hydrocarbon
PA	project action
PBA	programmatic biological assessment
PBO	Programmatic Biological Opinion
PCE	primary constituent element
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
RWQCB	Regional Water Quality Control Board
SPCC	Spill Prevention, Control, and Countermeasures
SPD	slope protection device
SSP	site-specific project
SWMP	*Statewide Stormwater Management Plan*
SYP	sustained yield plan
TESC	temporary erosion and sedimentation control
THP	timber harvest plan
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
WDR	waste discharge requirement

Chapter 1 Introduction

1.1 Programmatic Authorization Need and Objectives

The California Department of Transportation (Caltrans) is responsible for designing, constructing, maintaining, and operating the California state highway system (highways, bridges, and other transportation facilities), as well as the portion of the interstate highway system within the state's boundaries. To fulfill this responsibility, Caltrans conducts routine, often minor activities, such as maintaining roads; cleaning, rehabilitating, and replacing culverts; rehabilitating and replacing bridges; and performing exploratory geotechnical drilling. These activities regularly require state and federal environmental permits and authorizations from regulatory agencies, including the U.S. Army Corps of Engineers (Corps), the U.S. Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), the local Regional Water Quality Control Board (RWQCB), and the California Department of Fish and Game (DFG).

Currently, Caltrans prepares an individual environmental document and obtains individual and separate authorization and permits for each routine and minor activity that: 1) triggers Section 404 of the federal Clean Water Act (CWA) or that 2) is funded by the Federal Highway Administration (FHWA) and takes place in the aquatic/riparian environment. This practice is repetitive, time-consuming (up to 1 year or longer), and expensive for both Caltrans and the regulatory agencies. To streamline this process, Caltrans is seeking to obtain programmatic authorizations for the following regulatory requirements for their routine and minor maintenance[1] projects:

- Federal Endangered Species Act (ESA) Section 7 incidental take permit (NMFS)
- California Endangered Species Act (CESA) compliance (DFG)
- California Porter-Cologne Water Quality Control Act (Porter-Cologne Act) waste discharge requirements (WDRs) and CWA Section 401 certification (RWQCB)
- California Fish and Game Code (CFGC) Section 1602 long-term streambed alteration agreement (DFG)

This programmatic biological assessment (PBA) has been prepared to satisfy the programmatic authorization in accordance with legal requirements found in ESA Section 7(a)(2) (16 United States Code [USC] 1536[c]). It is designed to describe and address many of the routine activities that would result in *No Effect* (NE)[2], *May Affect*, Not Likely to Adversely Affect (NLTAA), and *May Affect, Likely to Adversely Affect* (LTAA) determinations that will be completed by Caltrans in the next 10 years associated with maintenance and operations of the state highway system

[1] The definition/characterization of covered actions (CAs) under Caltrans highway maintenance responsibilities applies only for the purposes of this Caltrans Programmatic Biological Assessment, submitted to NMFS by Caltrans under an assumption of authority granted pursuant to the Surface Transportation Project Delivery Pilot Program, 23 U.S.C. 327, and the July 1 2007, FHWA–Caltrans Memorandum of Understanding.

[2] Caltrans and NMFS will not initiate Section 7 consultation on SSPs when an NE determination is made. However, Caltrans is willing to provide NMFS with information regarding the frequency SSPs are implemented that were determined to have NE on federally protected species.

within the coverage area. This PBA is not project-specific, and it considers the effects of individual activities within the maintenance, preservation, and improvement programs administered by Caltrans Districts 1, 2, and 4. The PBA will cover those NLTAA and LTAA activities that fall into the defined categories and adhere to the best management practices (BMPs) presented in this document. Activities that do not fall into the defined categories or cannot meet the BMP requirements will not be covered under this programmatic consultation.

Caltrans, through the FHWA's and Corps' Section 7 process, is seeking incidental take authorization through a programmatic biological opinion (PBO) from NMFS. As the federal action agency for the Federal-aid Highway Program (under an assumption of authority per 23 U.S.C. 327), Caltrans is herein requesting programmatic consultation with NMFS for all federally funded Caltrans activities covered by the PBA. Caltrans also anticipates a request for programmatic consultation as a co-action agency of the Corps for activities that are considered a "discharge of dredged or fill material into waters of the United States," as defined under CWA Section 404, when such activities are not funded by FHWA. The Corps will confirm their participation as a co-action agency in this joint consultation by way of a separate transmittal letter. The activities addressed by the requested consultation could potentially affect species listed or proposed for listing and their designated or proposed critical habitats, as defined under Section 7 of the ESA. The area covered by the PBA includes north coast, San Francisco Bay, and central coast drainages in Caltrans Districts 1, 2, and 4.

1.2 Covered Activities

Caltrans is proposing that this PBA address five covered activities (CA): 1) slide abatement and repair; 2) safety improvement; 3) drainage system maintenance and repair; 4) bridge repair, retrofit, replacement, and maintenance; and 5) maintenance planning. These activities include only routine and minor actions required to maintain repair, and replace existing roads, culverts, bridges, and other highway infrastructure. Depending on the circumstances, these activities may be implemented alone or in different combinations to meet Caltrans' highway maintenance responsibilities.

The characterization of these activities as "routine maintenance" applies only for the purposes of this Caltrans Programmatic Biological Assessment, submitted to NOAA and USFWS under an assumption of authority granted pursuant to the Surface Transportation Project Delivery Pilot Program, 23 U.S.C. 327, and the July 1, 2007, Federal Highway Administration-Caltrans Memorandum of Understanding.

Each covered activity (CA) includes one or more site-specific project (SSP) that must be implemented to successfully complete maintenance and repair tasks. Each SSP in turn includes one or more project action (PAs) that is required to complete the project. Additionally, each PA will have one or more BMP that will be implemented to avoid and/or minimize impacts on listed species. Detailed information on all the CAs, SSPs, PAs, and BMPs covered in this PBA is provided in Chapter 5. Many of the BMPs are currently used on a regular basis by Caltrans' contractors and maintenance personnel to satisfy the requirements of the CWA. Additional BMPs (ABMPs) have been developed to be used in conjunction with the existing BMPs to enhance Caltrans ability to avoid and minimize potential impacts to federally listed species.

This hierarchical approach to describing the CAs provides a systematic breakdown of each CA component, which can then be evaluated with regard to the determination of potential impacts on listed species. The relationships between the CAs, SSPs, and PAs are shown below. The CAs and SSPs addressed in this PBA include:

- **CA-1:** Slide abatement and repair
  - **SSP-1.1:** Removal of slide and alluvial debris and soil from roadways, road shoulders, and side slopes
  - **SSP-1.2:** Stabilization of side slopes to minimize debris slides and damage to roads
  - **SSP-1.3:** Stabilization of stream banks and channels to minimize erosion and damage to adjacent roads, bridges, and culverts
- **CA-2:** Safety improvement
  - **SSP-2.1:** Maintenance, repair, and replacement of asphalt, concrete, and other construction materials on roads and other infrastructure
  - **SSP-2.2:** Installation and replacement of signs
  - **SSP-2.3:** Installation and replacement of guardrails
- **CA-3:** Drainage system maintenance and repair
  - **SSP-3.1:** Cleaning of drainage channels and ditches to maintain function and avoid damage to adjacent roads
  - **SSP-3.2:** Cleaning of sediment and debris from culverts and bridge abutments and supports to minimize erosion and damage to roads, culverts, and bridges and to maintain streamflow conditions
  - **SSP-3.3:** Rehabilitation of culverts to maintain function
  - **SSP-3.4:** Replacement, repair, and retrofitting of culverts to maintain culvert function and, where practicable, improve flow conditions to support fish passage and sediment transport
- **CA-4:** Bridge repair, retrofit, replacement, and maintenance
  - **SSP-4.1:** Repair of bridges to maintain function
  - **SSP-4.2:** Rehabilitation of small bridges to maintain bridge function and meet current standards and specifications (e.g., earthquake standards)
  - **SSP-4.3:**Replacement of small bridges to maintain bridge function, meet current standards and specifications, and, where practicable, improve flow conditions for fish passage and sediment transport

- **CA-5:** Maintenance planning
  - **SSP-5.1:** Drilling of geotechnical test holes to facilitate the early planning process for future culvert replacement, bridge rehabilitation and replacement, and side slope stabilization projects

Completion of all of the SSPs outlined in this PBA will require one or more of the following 29 PAs.

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment, debris, pavement, petroleum products, concrete, and other construction materials
- **PA-6:** Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure
- **PA-7:** Treat and discharge water conveyed from the construction area
- **PA-8:** Use drill rigs and drilling lubricants
- **PA-9:** Paint, wash, seal, and caulk bridges, guardrails, and other infrastructure
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-11:** Grade and establish temporary and permanent staging/storage areas for sediment, debris, and construction materials and equipment
- **PA-12:** Construct temporary sediment-settling basins
- **PA-13:** Grade temporary access roads and traffic detours
- **PA-14:** Operate construction equipment and vehicles in the stream channel
- **PA-15:** Construct temporary stream crossings
- **PA-16:** Remove and disturb aquatic vegetation, stream sediment, and large woody debris
- **PA-17:** Install temporary cofferdams and diversion cofferdams
- **PA-18:** Temporarily redirect streamflow
- **PA-19:** Temporarily draft water from streams and other water bodies
- **PA-20:** Install permanent and temporary rock slope protection (RSP), sheet piles, and retaining walls
- **PA-21:** Place concrete and concrete slurry seal coat in cofferdams, footing and bridge forms, culvert bedding, and other applications

- **PA-22:** Remove culverts
- **PA-23:** Clean, retrofit, or install culverts
- **PA-24:** Install fishways or stream gradient control structures
- **PA-25:** Remove existing bridge structure, including footings, piers, and piles
- **PA-26:** Install bridge structures, excluding impact pile-driving
- **PA-27:** Blast rock and other substrate
- **PA-28:** Capture, handle, exclude, salvage, and relocate listed species
- **PA-29:** Implement BMPs
- **PA-30:** Mitigation framework for potential adverse impacts on species listed under CESA

1.3 Coverage Area

The PBA coverage area encompasses north coast, San Francisco, and central coast drainages within Caltrans Districts 1, 2, and 4. The coverage area begins at the Oregon border, extends down the California coast to near Santa Cruz, and extends inland to the Trinity Mountains and Coast Ranges, including San Francisco Bay up to the Carquinez Strait, and excluding the Sacramento River basin (Figure 1-1). The proposed CAs will take place at existing roadways, bridges, and other transportation-related infrastructure maintained within these districts.

Figure 1-1: Program Area

1.4 Listed Species Covered Under this PBA

Table 1-1 lists the species proposed for coverage in this PBA. Distribution and occurrences within the PBA coverage area are provided in Chapter 4 their ecological status and requirements is discussed in Appendix A.

Table 1-1. Listed Species Proposed for PBA Coverage

Common Name	Scientific Name	Federal Status
Fish		
Chinook Salmon	*Oncorhynchus tshawytscha*	
California coastal ESU		T
Sacramento River winter-run ESU		E
Central Valley spring-run ESU		T
Coho Salmon	*Oncorhynchus kisutch*	
Central California coast ESU		E
Southern Oregon/Northern California coast ESU		T
Steelhead	*Oncorhynchus mykiss*	
Northern California DPS		T
Central California coast DPS		T
California Central Valley DPS		T
Southern DPS Green Sturgeon	*Acipenser medirostris*	T
Southern DPS Pacific Eulachon/Smelt	*Thaleichthys pacificus*	T
Marine Mammals		
Steller sea lion	*Eumetopias jubatus*	T
Blue whale	*Balaenoptera musculus*	E
Humpback whale	*Megaptera novaeangliae*	E
Fin whale	*Balaenoptera physalus*	E
Sei whale	*Balaenoptera borealis*	E
Sperm whale	*Physeter macrocephalus*	E
Reptiles		
Leatherback turtle	*Dermochelys coriacea*	E
Olive ridley turtle	*Lepidochelys olivacea*	E
Loggerhead turtle	*Caretta caretta*	T
Green turtle	*Chelonia mydas*	E

Notes: ESU = Evolutionarily Significant Unit DPS = Distinct Population Segment.
E = Federally listed as endangered T = Federally listed as threatened

Chapter 2 The PBA Process

At the beginning of each calendar year, Caltrans planning and maintenance staff determine the maintenance needs within each District. Based on previous trends in maintenance activities and general conditions, such as the magnitude and degree of storm activity during the current season, staff will evaluate the number, types, and locations of maintenance projects that may be needed. The process represents a major effort that typically lasts from January through March, and can extend into the "implementation" period (April through June, or later). Identifying culvert maintenance needs, however, can occur throughout the year. Often, specific culvert repair, cleaning, and other culvert maintenance needs are not determined until onsite inspections are made. Once maintenance projects are identified, the district staff will then work with district project biologists to determine: which projects meet the requirements of this PBA, how each project will be implemented, and those projects that will require individual biological assessments (BAs). The procedural steps in this project development process (i.e., project review, authorization, implementation, and management) may include:

- project site characterization,
- covered species determination,
- impact analysis,
- SSP effect determination,
- SSP categorization,
- project authorization review,
- project implementation,
- adaptive management, and
- reporting process.

2.1 Project Design

The CAs identified by Caltrans for implementation can be initially grouped according to the nature of the SSPs, as identified in Chapter 1. Detailed descriptions of these CAs are provided in Chapter 5. The PAs required to complete each SSP will be determined by the planning and maintenance staff and may vary with location, season, and the covered species that may occur within the action area. Because most of the CAs presented in this PBA are routine and have been implemented many times, the PAs are well known to the planning and maintenance staff. Chapter 5 also provides complete descriptions of each PA that could be used to complete an SSP. A Caltrans guidance document delineating the PAs routinely used for each project activity, along with standards, constraints, and BMPs, will be developed to provide direction on project design and implementation.

2.2 Project Site Characterization

As part of the planning process, each project site will be characterized according to its location (district, watershed, mile post, proximity to water bodies, etc.). The site-specific location of each project will in turn determine the geometry and extent of the PA area, as well as the ecological habitats contained therein. These habitats will determine what species occur or could potentially occur in the PA area. Where feasible, projects will be implemented during the season that allows the maximum avoidance or minimization of potential impacts on the covered species. For example, projects involving in-water activities will generally be implemented during the dry season for ephemeral streams that support listed fish species, or during times when those fish are least likely to be present in perennial streams. When in-water work is necessary during sensitive periods in perennial streams that support federally protected species, rationale for working during these periods will be documented and in some cases agencies will be notified. The location, species, and season can in turn provide feedback during the review process to better determine the optimal schedule for the project, helping avoid or minimize potential impacts on the covered species.

2.3 Covered Species Determination

As described above, what listed species are likely to occur in the project area will depend upon the location and extent of the PA area and the season when the project is implemented. For most SSPs, the project biologist will be able to infer the presence or absence of a species based on occurrences documented in available reports or data files and/or knowledge of the suitability of the habitat within the PA. When such information is unavailable or additional confirmation is needed, inquiries with local, state, federal, or tribal biologists may be required to determine or infer species presence.

2.4 Impact Analysis

Chapter 6 presents an analysis of the potential effects of the CAs on the covered species. However, because every scenario, location, or setting where a CA may be implemented cannot be predicted using this programmatic approach, some additional information or analysis may be required. Therefore, once the PAs and covered species have been defined more completely, the potential impacts of particular PAs on the covered species can be evaluated fully.

Each PA and the synergistic effects of combined PAs can potentially affect covered species occurring within the PA area. Determining these impacts will depend on understanding the existing physical, chemical, and biological conditions within the PA area, how the PAs will or could affect these conditions, and how these changed conditions can in turn affect the listed species covered under this PBA.

2.5 Site-Specific Project Effect Determination

The overall effect determination for the CAs (i.e., NE, NLTAA, or LTAA) depends on the summary evaluation of individual and combined effects of PAs on each covered species. Only one effect determination will be made for each species based on the CA implemented.

Figure 2-1 provides a decision tree flowchart for the project categorization process. Figures 2-2 to 2-4 provide decision tree flowcharts for making effect determinations for each covered species potentially affected by the project. Specifically, Figure 2-2 provides the project authorization and implementation process for NMFS, and Figures 2-3 and 2-4 provide simple decision tree flowcharts for making effect determinations for fish/wildlife and plants, respectively, that would be potentially affected by the CAs. These determinations will be inserted into a PBA form (example in Appendix B) for each species and evaluated in total for a final effect determination specific to the CA implemented. The specific form used will depend on the nature and level of effect determination and may be customized to more accurately capture the conditions and requirements of the specific CA. The structure and content of these forms will be developed over time as the CAs, PAs and SSPs become better defined.

2.6 Site-Specific Project Categorization

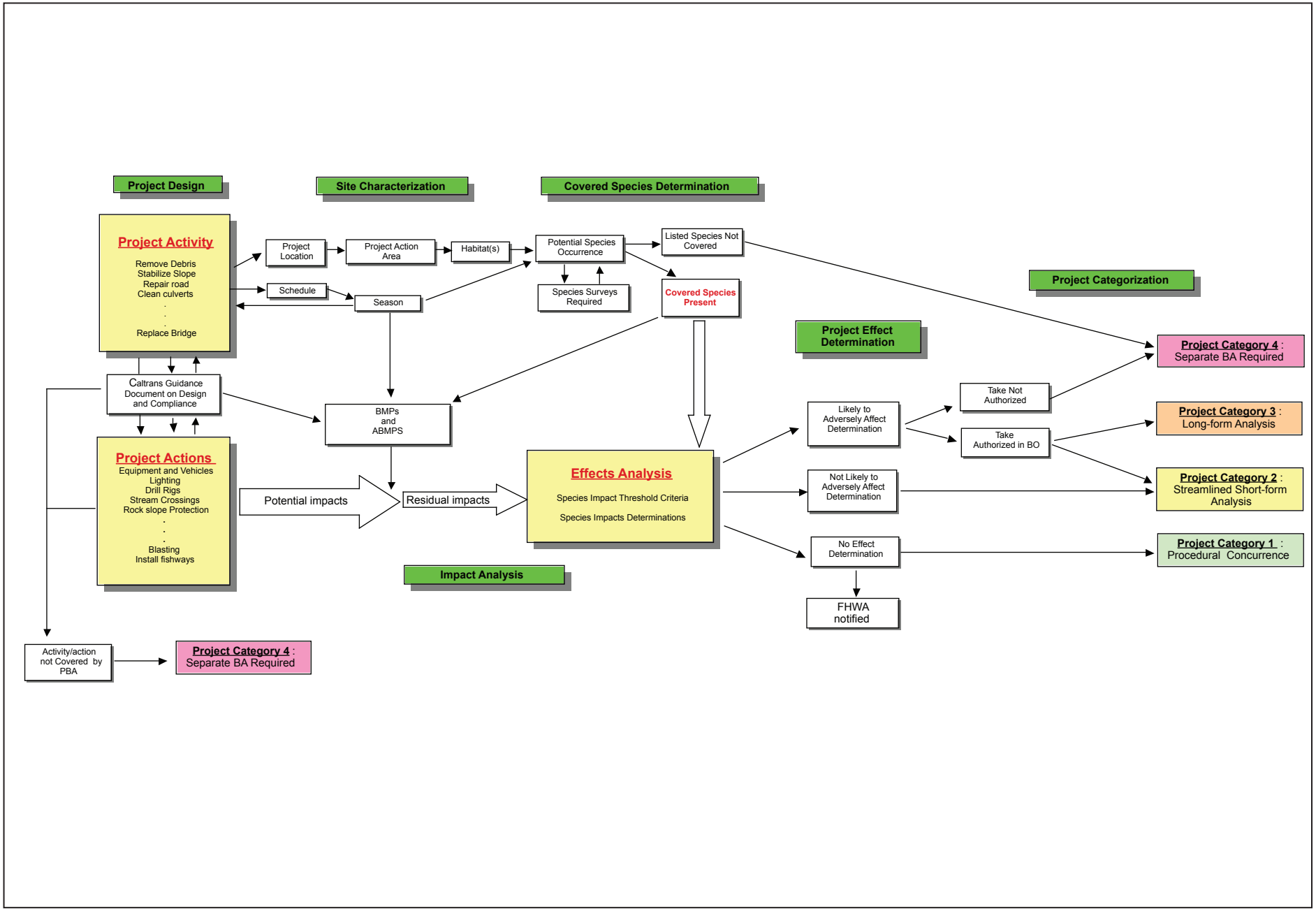
Once the effect determination has been made for an SSP, the SSP can then be categorized according to the level of regulatory review necessary for authorization and implementation. Initially, most SSPs implemented (each SSP will have some variation in the PAs required for completion, location, and species potentially affected) should be reviewed by the participating federal and state agencies for consensus on the procedural and factual basis for categorization. Some SSPs, particularly those found to be clearly NLTAA, will be reported and reviewed after the fact on a regular basis. Repetition of the same SSP (identical effects and implementation criteria) can then, in the future, proceed according to the established routine regulatory requirements for each category. The project categorization process is illustrated in Figure 2-1. The four project categories (1–4) are discussed below.

2.6.1 Project Category 1

SSPs in Category 1 would have an effect determination of NE on covered species when implemented with appropriate avoidance BMPs, as specified in this PBA and the PBO.

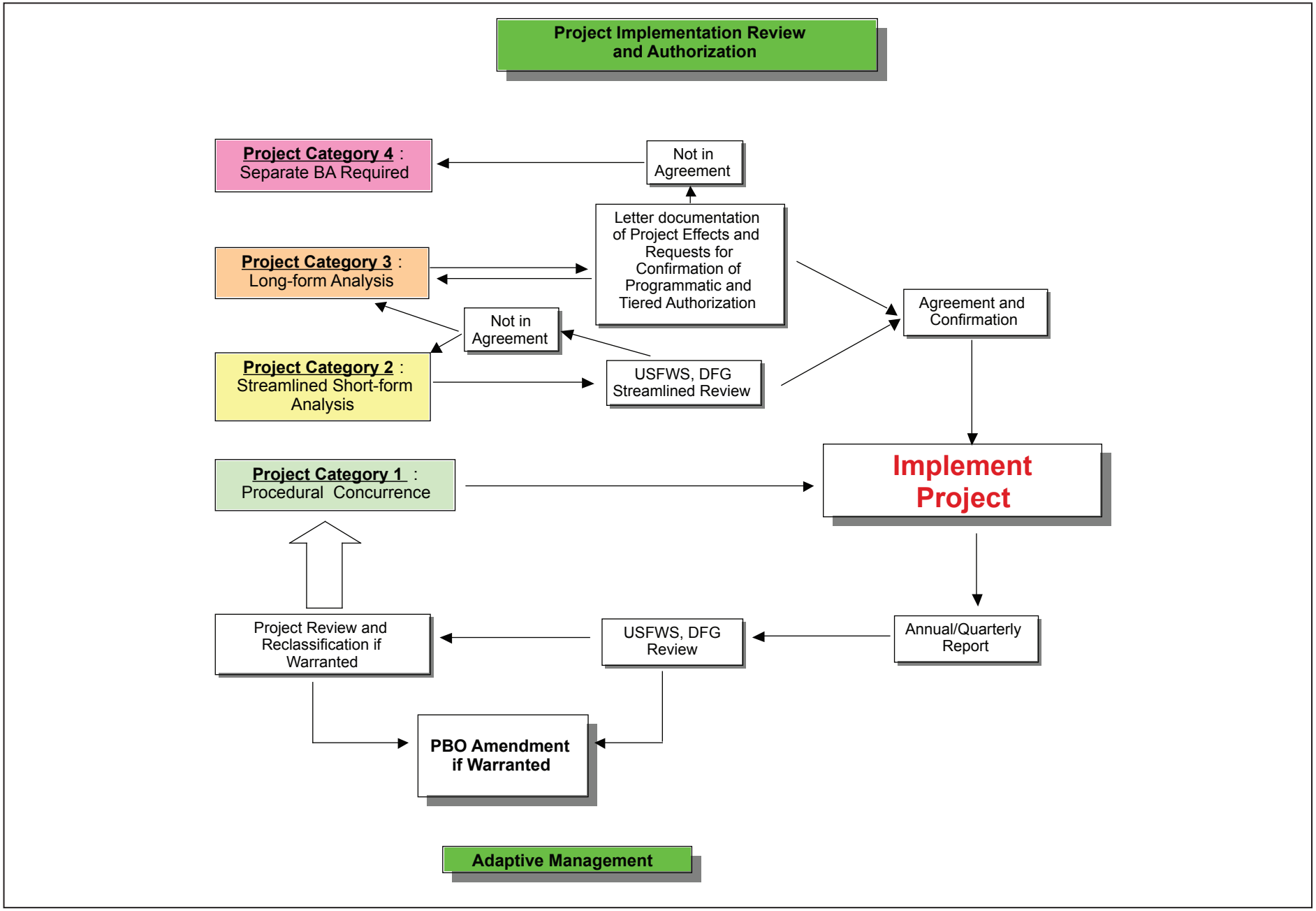
2.6.2 Project Category 2

SSPs in Category 2 include those SSPs that have a determination of NLTAA. Because the project would not adversely affect a covered species, no authorization to proceed will be required. A short-form analysis will be completed for each Category 2 project to provide the rationale for these determinations, until routine implementation shows that no adverse effects occur and short-form analysis is no longer required. These determinations will be reviewed annually by the oversight regulatory agencies to determine whether formal notification and review is required under this category or whether the SSPs can continue to be implemented without project-specific notification.



06211.06 North Coast COHO PBA's (03-08)

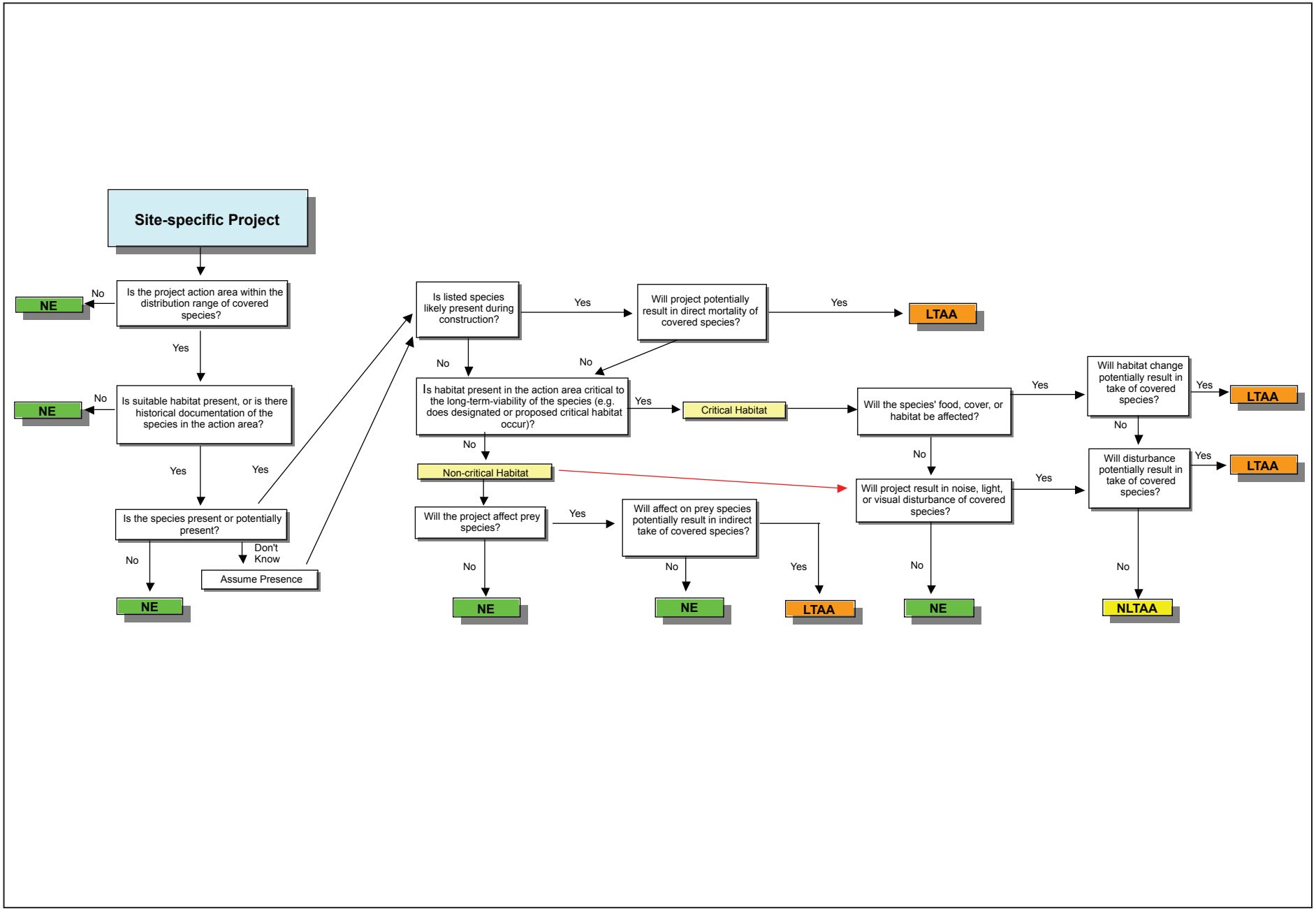
Figure 2-1
Caltrans USFWS PBA Project Categorization Process



06211.06 North Coast COHO PBA's (03-08)

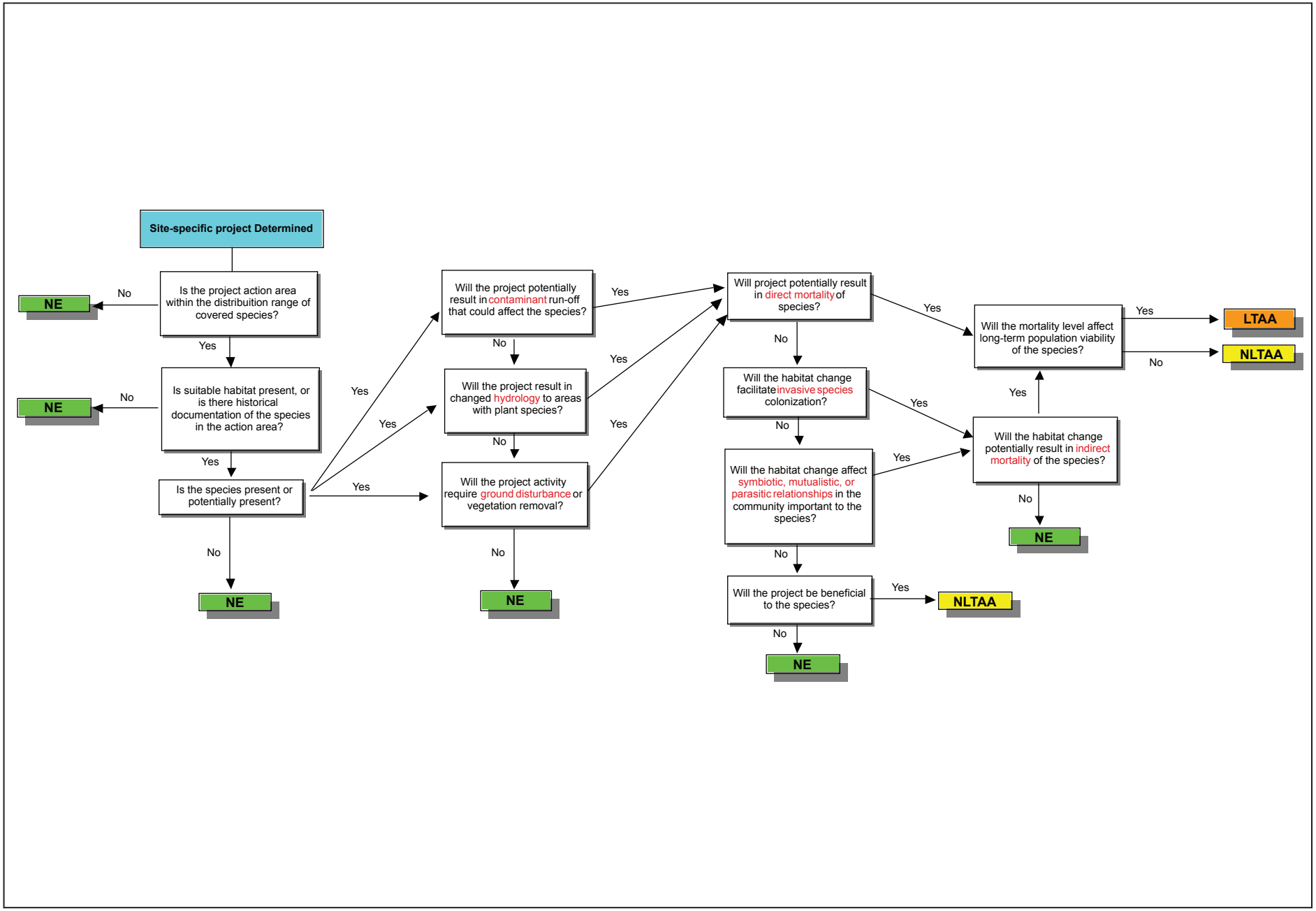
Figure 2-2

Caltrans USFWS PBA Project Authorization and Implementation Process



06211.06 North Coast COHO PBA's (03-08)

Figure 2-3
Effect Determinations for Fish and Wildlife



06211.06 North Coast COHO PBA's (03-08)

Figure 2-4
Effect Determinations for Plant Species

2.6.3 Project Category 3

SSPs in Category 3 include those SSPs that have a determination of LTAA and the level of effect (i.e., take) falls within the acceptable limits stipulated in the PBO. For these projects, a greater level of agency review and formal concurrence in the form of a letter of rationale tiered from the PBO will be required to ensure accuracy and consistency in authorization of SSPs (and BMPs) before implementation. The letters will make a finding as to whether the proposed activity is covered by the PBA and includes any necessary minimization measures. Authorization to proceed may be required from the oversight regulatory agencies before implementation of such projects.

2.6.4 Project Category 4

SSPs in Category 4 include those SSPs that exceed the level of effect stipulated in the PBO and are not consistent with the project description or the terms and conditions of the PBO. SSPs that fall in this category will likely require separate, individual ESA Section 7 consultation (formal or informal) with the agencies for authorization.

2.7 Project Authorization Review

Following project categorization and review (as described in Section 2.6), a project may be authorized to proceed. Authorization will depend upon agreement from the reviewing agencies (e.g., USFWS, NMFS, and DFG) on the project effect determination and compliance with PBO terms and conditions, and any take authorizations. Category 2 projects found, after-the-fact, to be incorrectly categorized, can be reevaluated and modified, if appropriate, or rerouted through the Category 3 long-form analysis to provide the reviewing agencies with greater detail on the avoidance and minimization of impacts that merit project authorization. Category 3 projects that are not in agreement with agency determinations cannot be implemented under this PBA unless they are revised to comply with the PBO. Generally, though, the annual reviews are intended to provide guidance for future proper project design and categorization and agency notification.

2.8 Project Implementation

All projects receiving either procedural concurrence or agency authorization to proceed can be implemented according to the limits, constraints, and allowances stated in the PBO and agency authorization.

2.9 Adaptive Management

As CAs are repeatedly reviewed and implemented, it may become evident that some should be recategorized, particularly if the review process merits streamlining (e.g., Category 3 to Category 2, or Category 2 to Category 1) or if greater scrutiny is required (e.g., Category 2 to Category 3). These recategorization determinations can be made part of an adaptive management process included in the annual (or longer) PBO review program.

2.10 Reporting Process

Caltrans will routinely submit tracking and monitoring reports to the Corps, FHWA, and NMFS on the use of the PBA, per the reporting protocol and report content agreed to between these

agencies and Caltrans. The monitoring reports will be submitted on a semi-annual basis for the first year, then annually for a period of 10 years (submitted by September 15 of each year) unless a different schedule is agreed upon at any point. The monitoring reports will provide notification and a tally for the CAs as follows:

- The monitoring report will include a random sample of SSP documentation, including site specific PBA forms (e.g. Appendix B) and project plans (when available). The PBA forms will provide the specific environmental baseline conditions (i.e., physical, chemical and biological conditions) for each CA implemented under this PBA, within the defined PA area. However, for identical and repetitive CAs at multiple sites it is expected that some activities will not require preparation of individual site location forms (e.g., multiple culvert cleanings with NLTAA determinations). For mutually agreed upon project types only lists of locations, description of activities, and effect determinations will be provided.

- The monitoring reports will provide a summary of all reportable activities performed during the reporting period, a discussion of any compliance or enforcement issues associated with the PBA, how these issues were resolved, and proposals for any revisions to the consultation. Revisions may include (but are not limited to) changes in general minimization measures, changes in approved work windows, changes in specific project parameters, and additional activities.

Chapter 3 The PBA Coverage Area

The PBA coverage area in which the proposed CAs will occur includes the portions of Caltrans Districts 1, 2, and 4 that lie within the north coast, San Francisco Bay, and central coast watersheds except for areas draining to the Delta in or above the Carquinez Strait (Figure 1-1). Within each district, SSPs will be located at Caltrans facilities along the highways they maintain and operate. (Figures 3-1 through 3-14) The PA areas will be defined by the outermost extent of all project effects, including those associated with interrelated and interdependent activities, occurring within both aquatic and terrestrial environments.

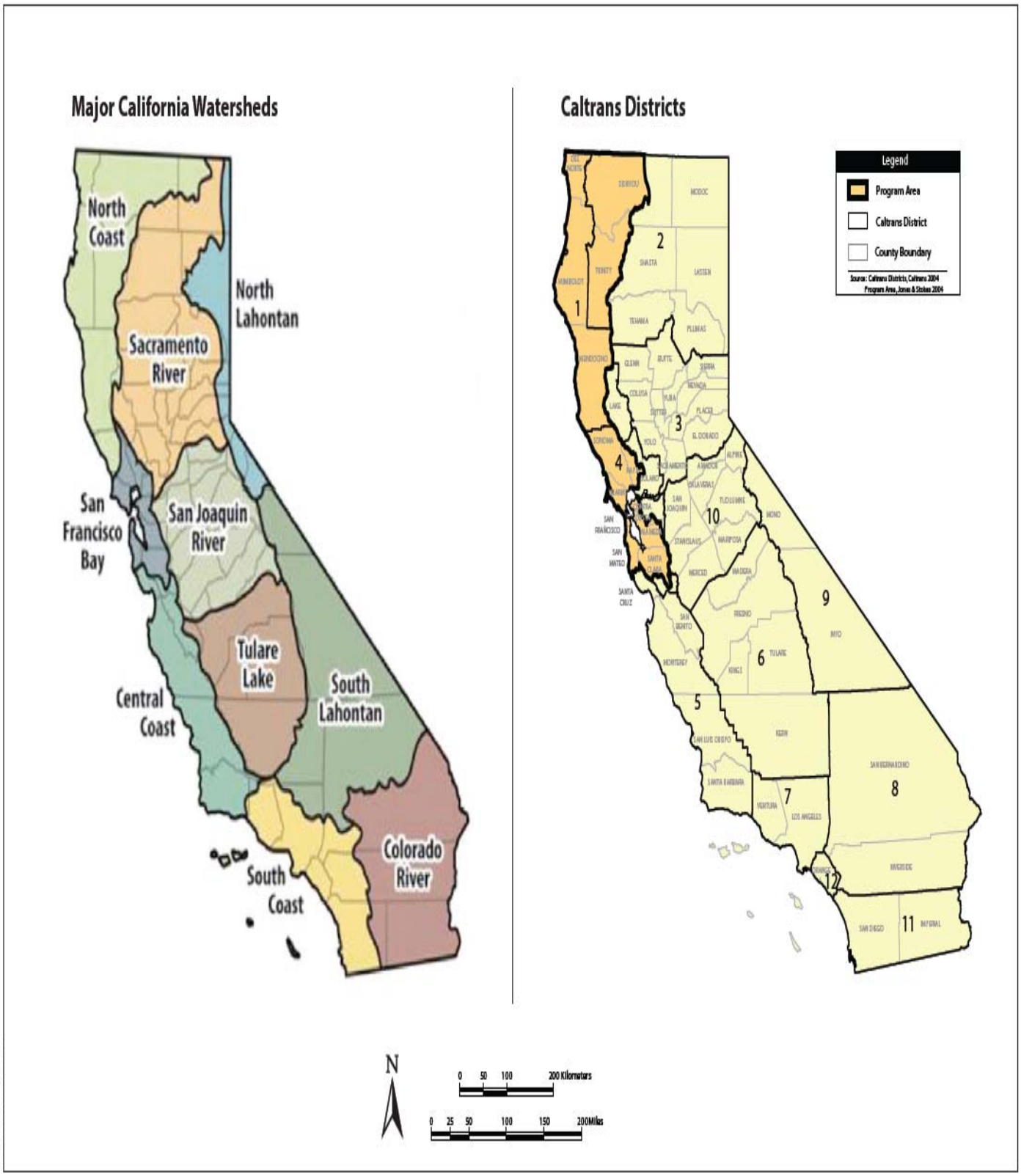
This chapter provides information on fish distribution and habitat types found within Caltrans Districts 1, 2, and 4. The information is intended to document the diversity of fish and fish habitat that may be encountered on projects throughout Districts 1, 2, and 4. However, this information will need to be supplemented based on the location of each CA implemented through querying the CalFish database, reviewing basin-specific publications, and contacting local DFG, NMFS, USFWS, and other fisheries biologists familiar with the aquatic habitats in the location in which a CA is to be implemented.

This chapter includes sections for each of the watersheds within the coverage areas, providing detailed information on the following:

- **Location:** Describes the three major watersheds that are included in this PBA.
- **Species Occurrence:** Reviews the status and habitat requirements of federally listed fish commonly found in the covered areas in Districts 1, 2, and 4.

3.1 Watersheds and Districts

The California Resources Agency identifies 10 major watersheds throughout the state (Figure 3-1). The coverage area includes much of the north coast and San Francisco Bay watersheds, and a small portion of the central coast watershed. There are 12 Caltrans districts in California (Figure 3-1). Figures 3-2 through 3-14 provide maps of the coverage area by Caltrans District and the overlap of covered species ESUs and DPSs. Table 3-1 shows the relationship between the major watershed areas and the 12 Caltrans districts. The districts and watersheds contained within the PBA coverage area are shown in bold.



062 11 06 PBAs (03-08)

Figure 3-1
California Watersheds in the Program Area

Figure 3-2. Caltrans Facilities Within Alameda County

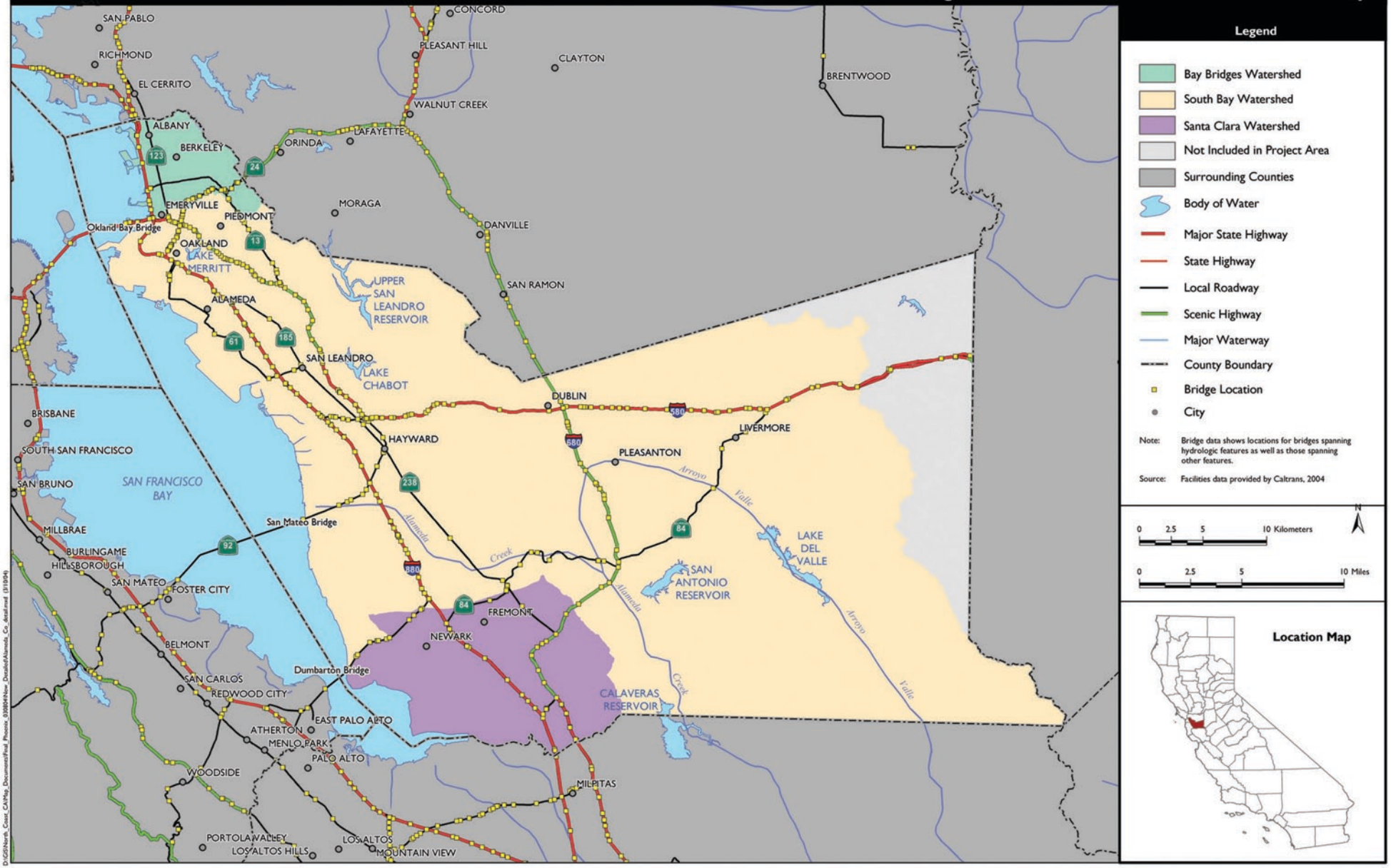


Figure 3-3. Caltrans Facilities Within Contra Costa County

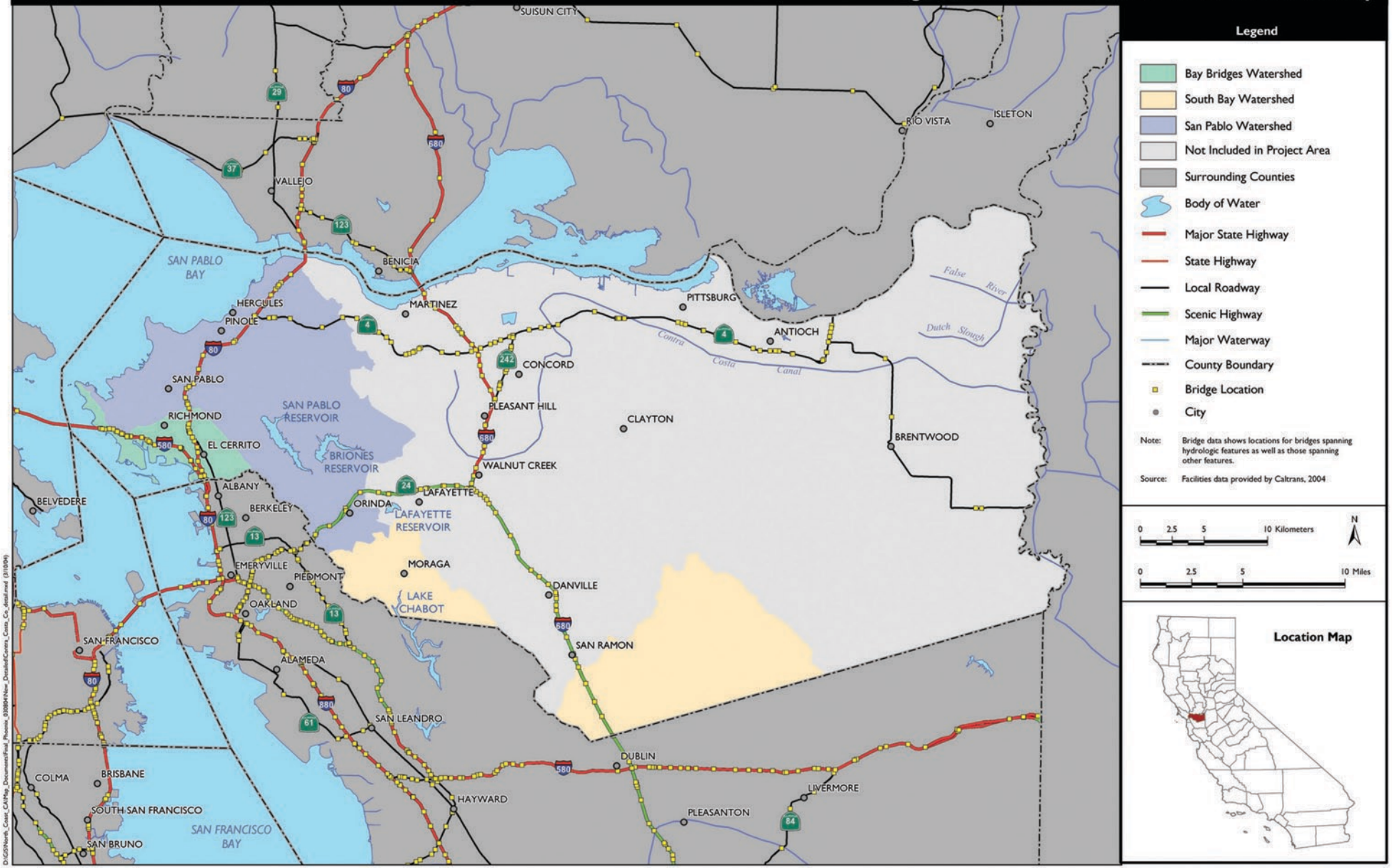
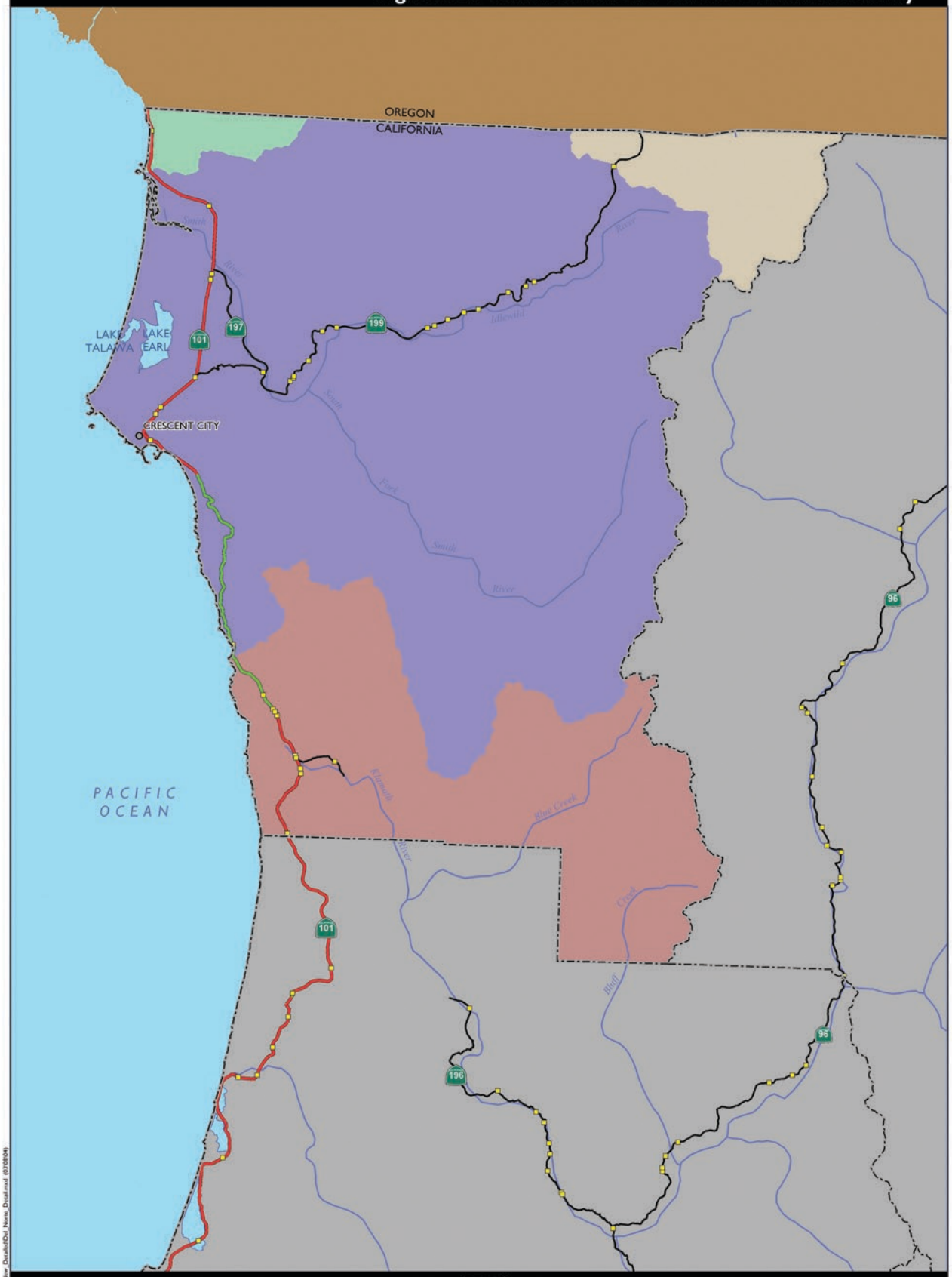


Figure 3-4: Caltrans Facilities Within Del Norte County



Legend

- Major State Highway
- State Highway
- Local Roadway
- Scenic Highway
- County Boundary
- Major Waterway
- Bridge Location
- City
- Klamath River Watershed
- Rogue River Watershed
- Smith River Watershed
- Winchuck River Watershed
- Surrounding Counties
- Body of Water

Note: Bridge data shows locations for bridges spanning hydrologic features as well as those spanning other features.

Source: Facilities data provided by Caltrans, 2004

0 2.5 5 10 Miles

0 5 10 20 Kilometers

N

Location Map

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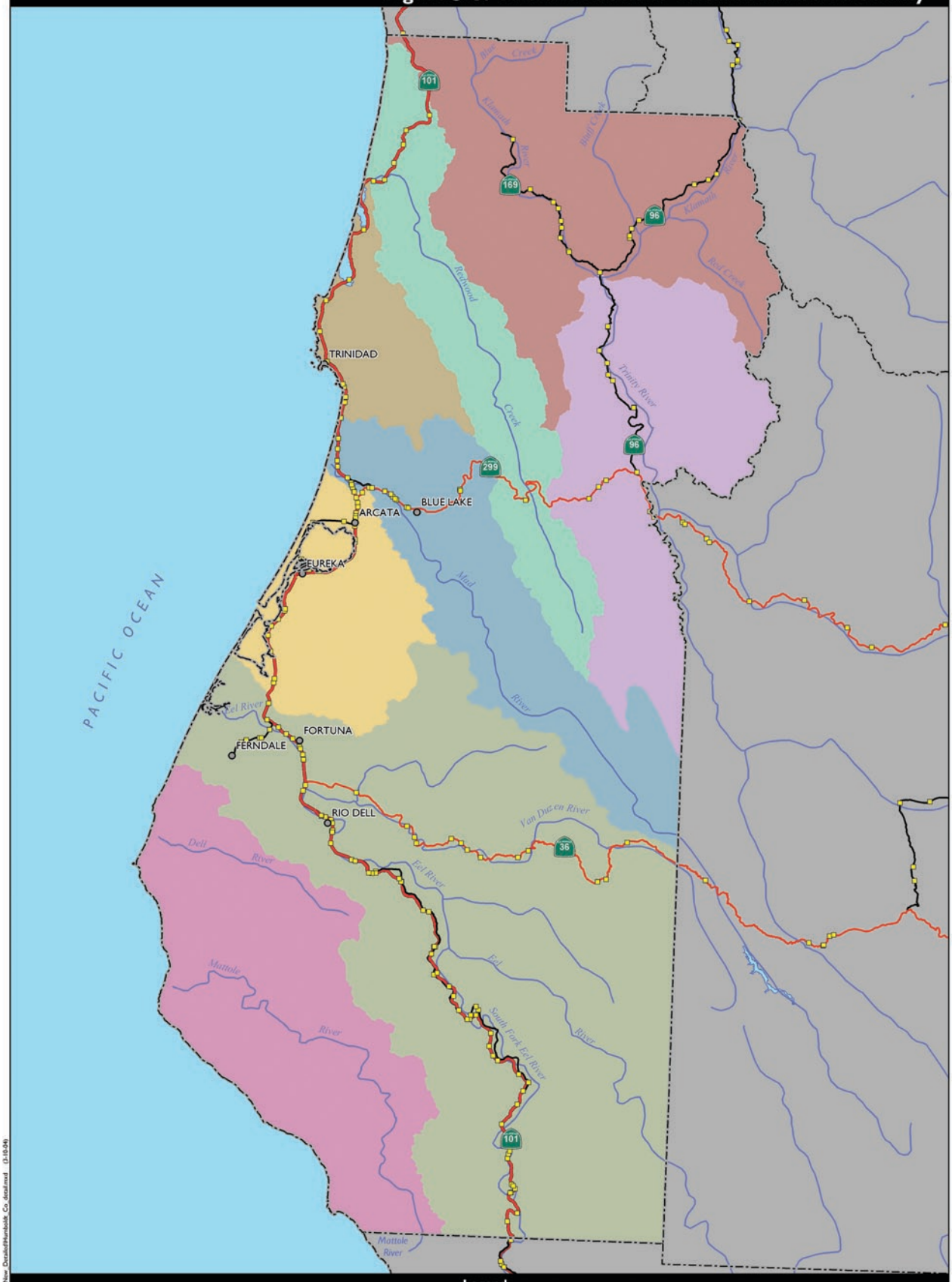
Figure 3-5: Caltrans Facilities Within Humboldt County



Legend

- Major State Highway
- State Highway
- Local Roadway
- Scenic Highway
- County Boundary
- Major Waterway
- Bridge Location
- City
- Klamath River Watershed
- Trinidad Watershed
- Redwood Creek Watershed
- Trinity River Watershed
- Mad River Watershed
- Eureka Plain Watershed
- Eel River Watershed
- Cape Mendocino Watershed
- Surrounding Counties
- Body of Water

Note: Bridge data shows locations for bridges spanning hydrologic features as well as those spanning other features.

Source: Facilities data provided by Caltrans, 2004

0 2.5 5 10 Miles

0 5 10 20 Kilometers

N

Location Map

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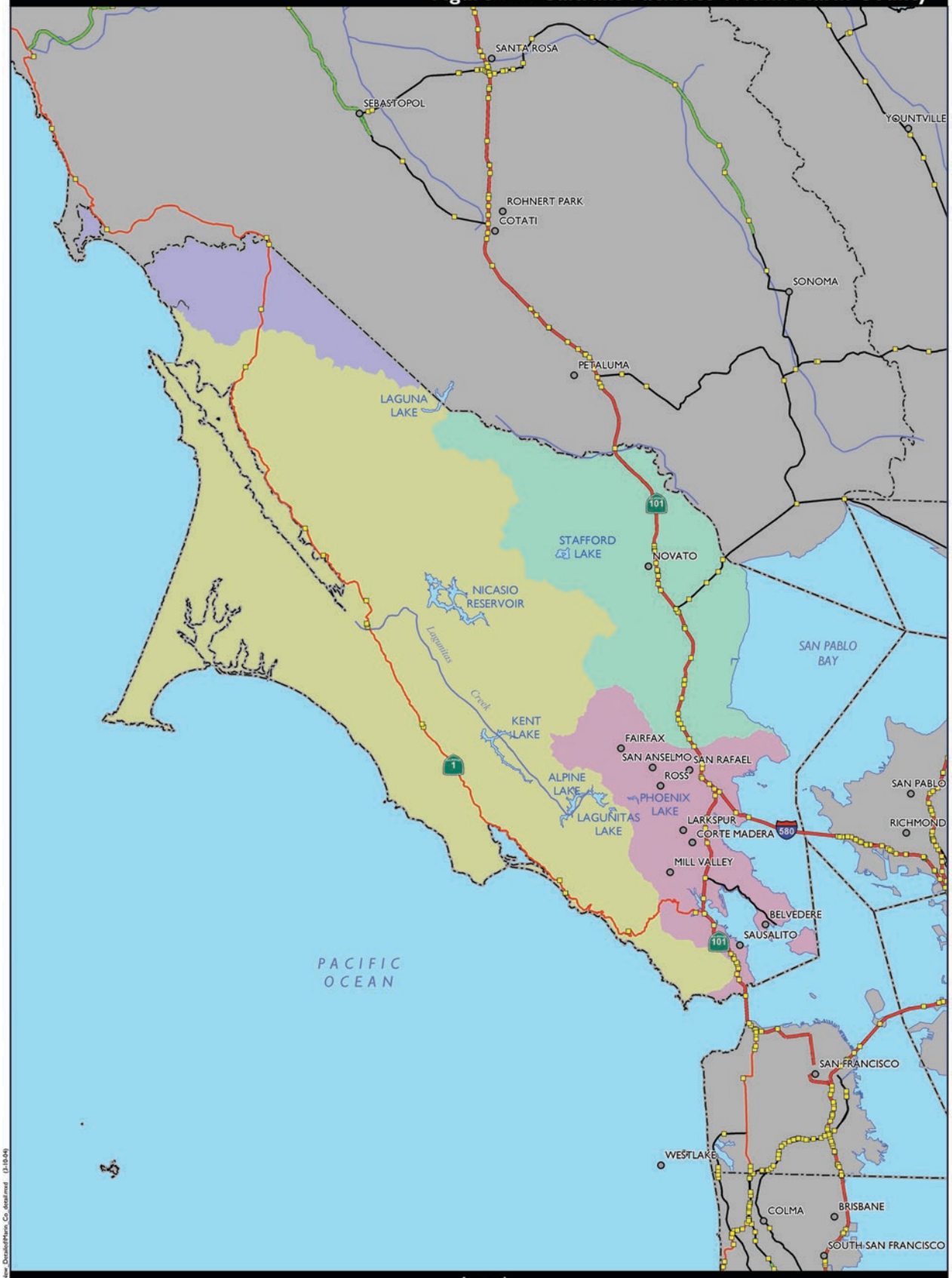
Figure 3-6: Caltrans Facilities Within Marin County



Legend

- Major State Highway
- State Highway
- Local Roadway
- Scenic Highway
- County Boundary
- Major Waterway
- Bridge Location
- City
- Bodega Watershed
- Marin Coastal Watershed
- San Pablo Watershed
- Bay Bridges Watershed
- Surrounding Counties
- Body of Water

Note: Bridge data shows locations for bridges spanning hydrologic features as well as those spanning other features.

Source: Facilities data provided by Caltrans, 2004

0 2.5 5 Miles

0 5 10 Kilometers

N

Location Map

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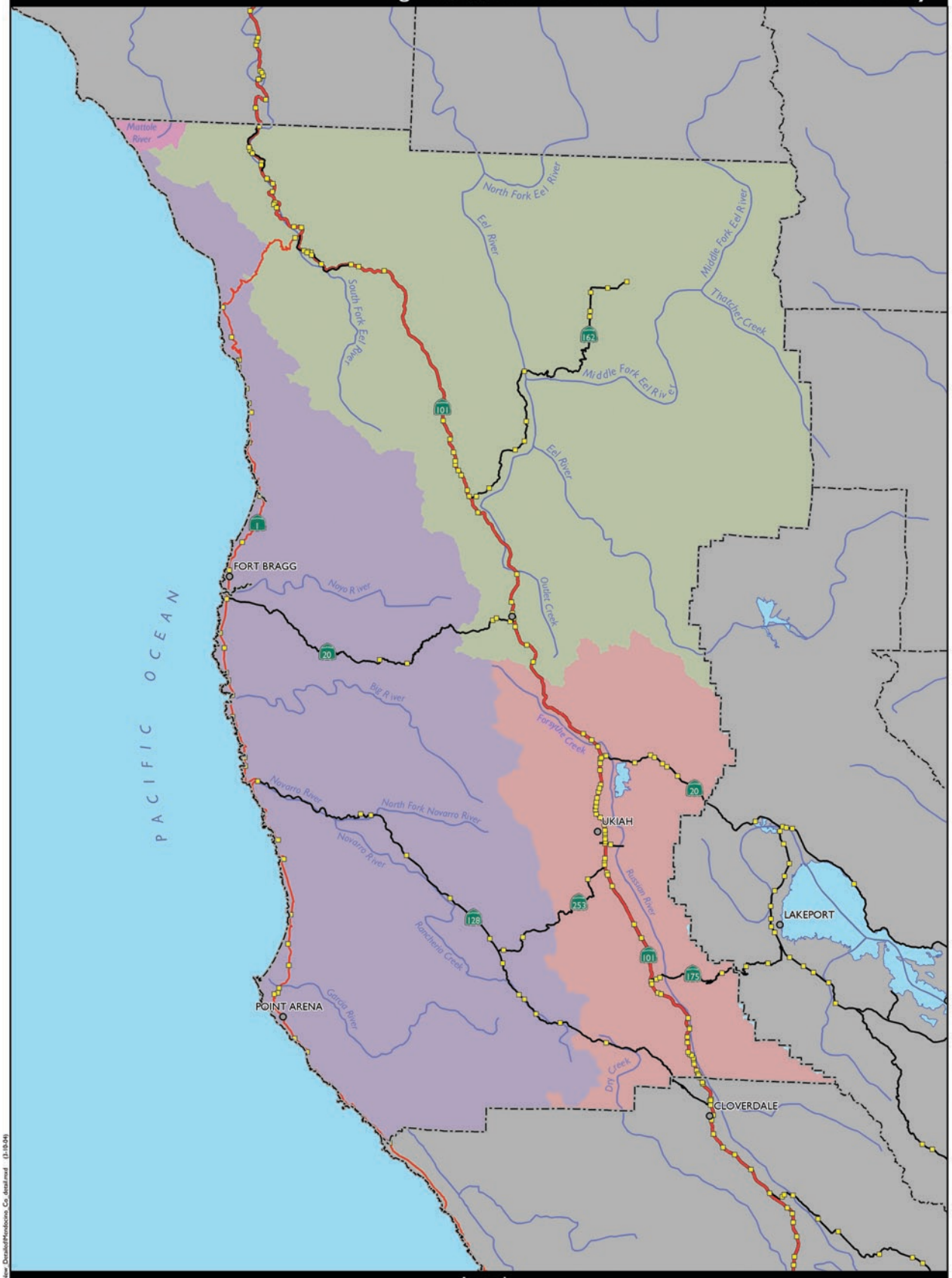
Figure 3-7: Caltrans Facilities Within Mendocino County



Legend

- Major State Highway
- State Highway
- Local Roadway
- Scenic Highway
- County Boundary
- Major Waterway
- Bridge Location
- City
- Cape Mendocino Watershed
- Eel River Watershed
- Mendocino Coast Watershed
- Russian River Watershed
- Surrounding Counties
- Body of Water

Note: Bridge data shows locations for bridges spanning hydrologic features as well as those spanning other features.

Source: Facilities data provided by Caltrans, 2004

0 2.5 5 10 Miles

0 5 10 20 Kilometers

N

Location Map

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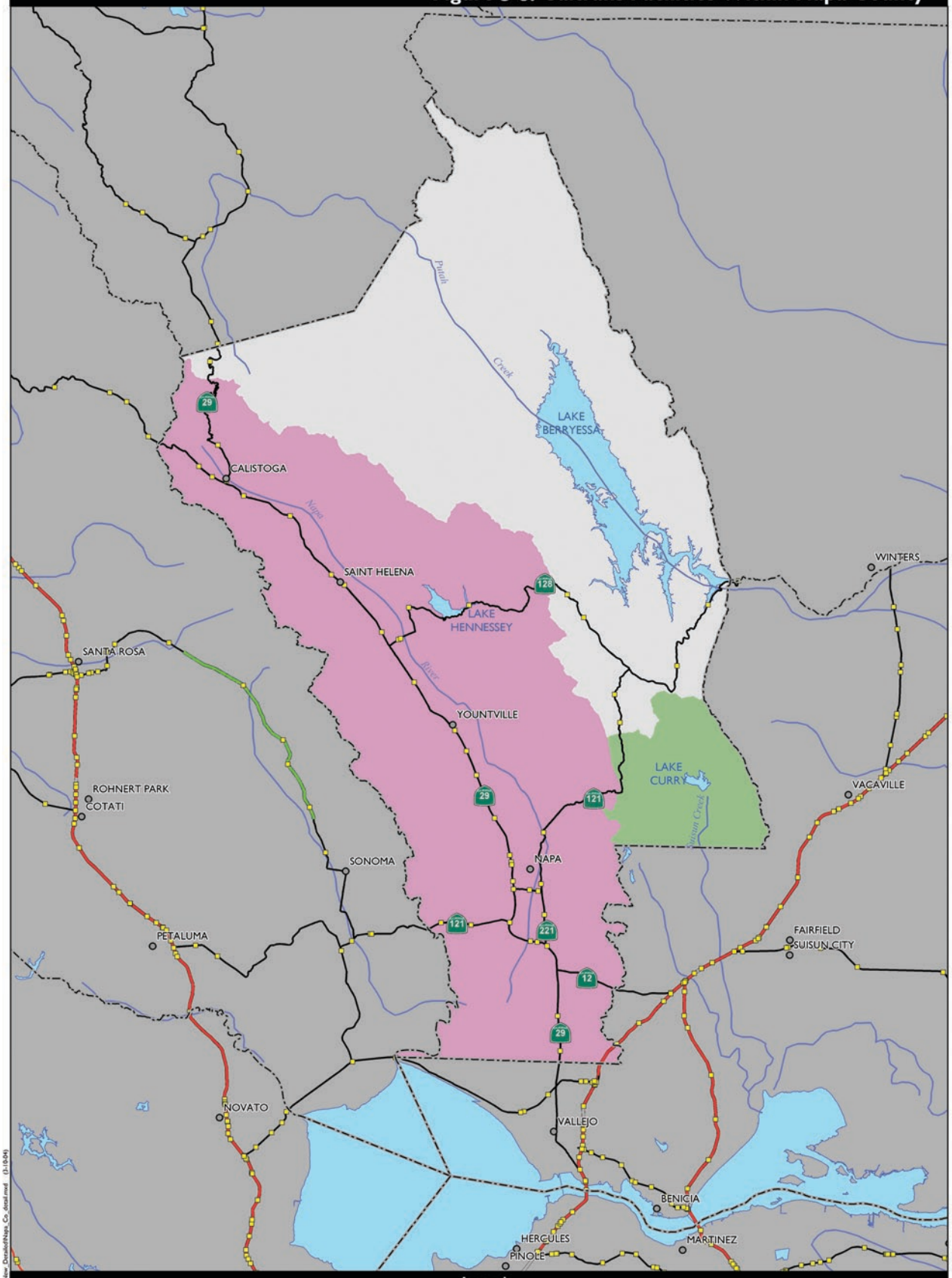
Figure 3-8: Caltrans Facilities Within Napa County



Legend

- Major State Highway
- State Highway
- Local Roadway
- Scenic Highway
- County Boundary
- Major Waterway
- Bridge Location
- City
- San Pablo Watershed
- Suisun Watershed
- Not Included in Project Area
- Surrounding Counties
- Body of Water

Note: Bridge data shows locations for bridges spanning hydrologic features as well as those spanning other features.

Source: Facilities data provided by Caltrans, 2004

0 2.5 5 10 Miles

0 5 10 20 Kilometers

N

Location Map

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Figure 3-9: Caltrans Facilities Within San Francisco County

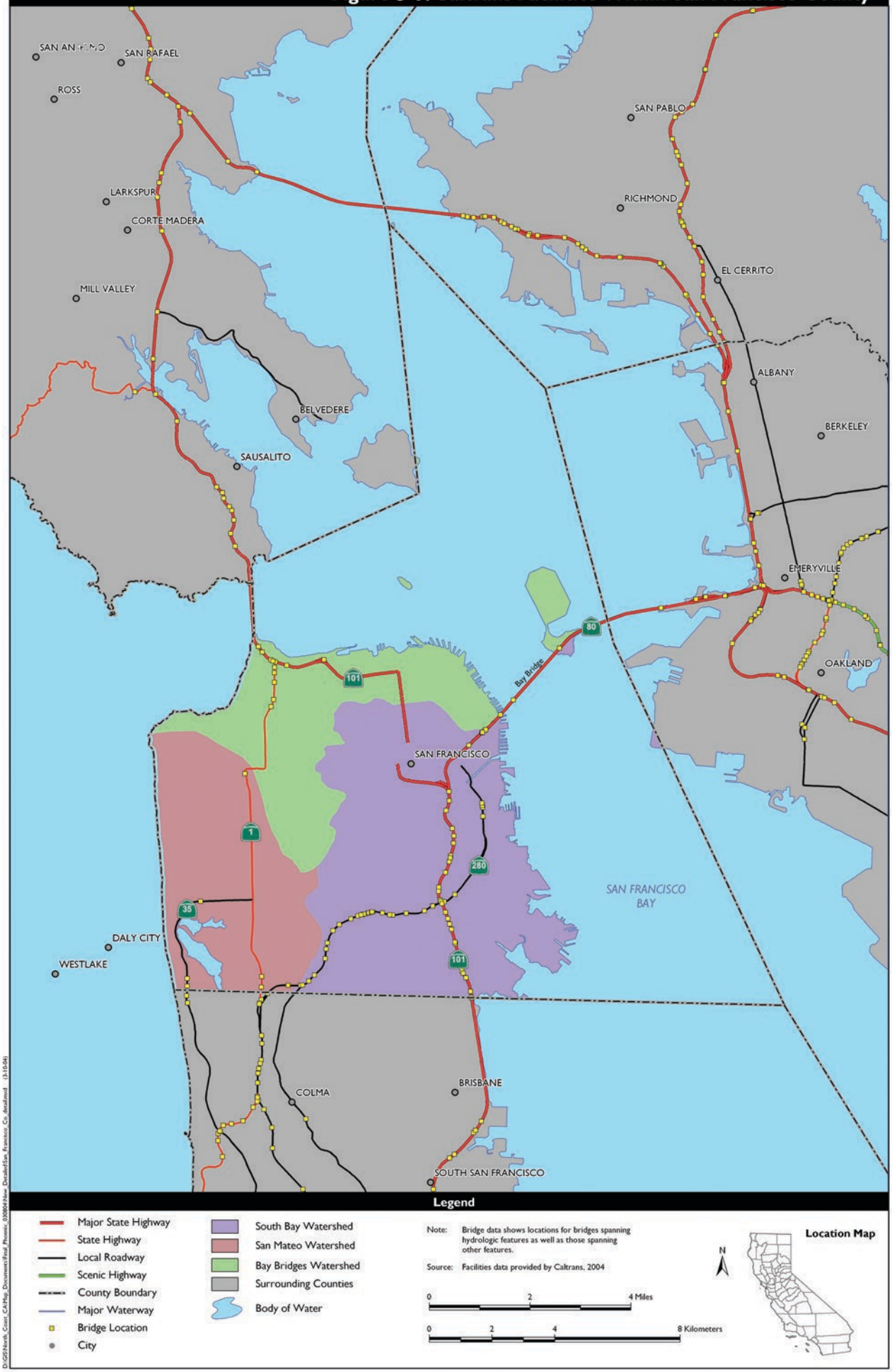
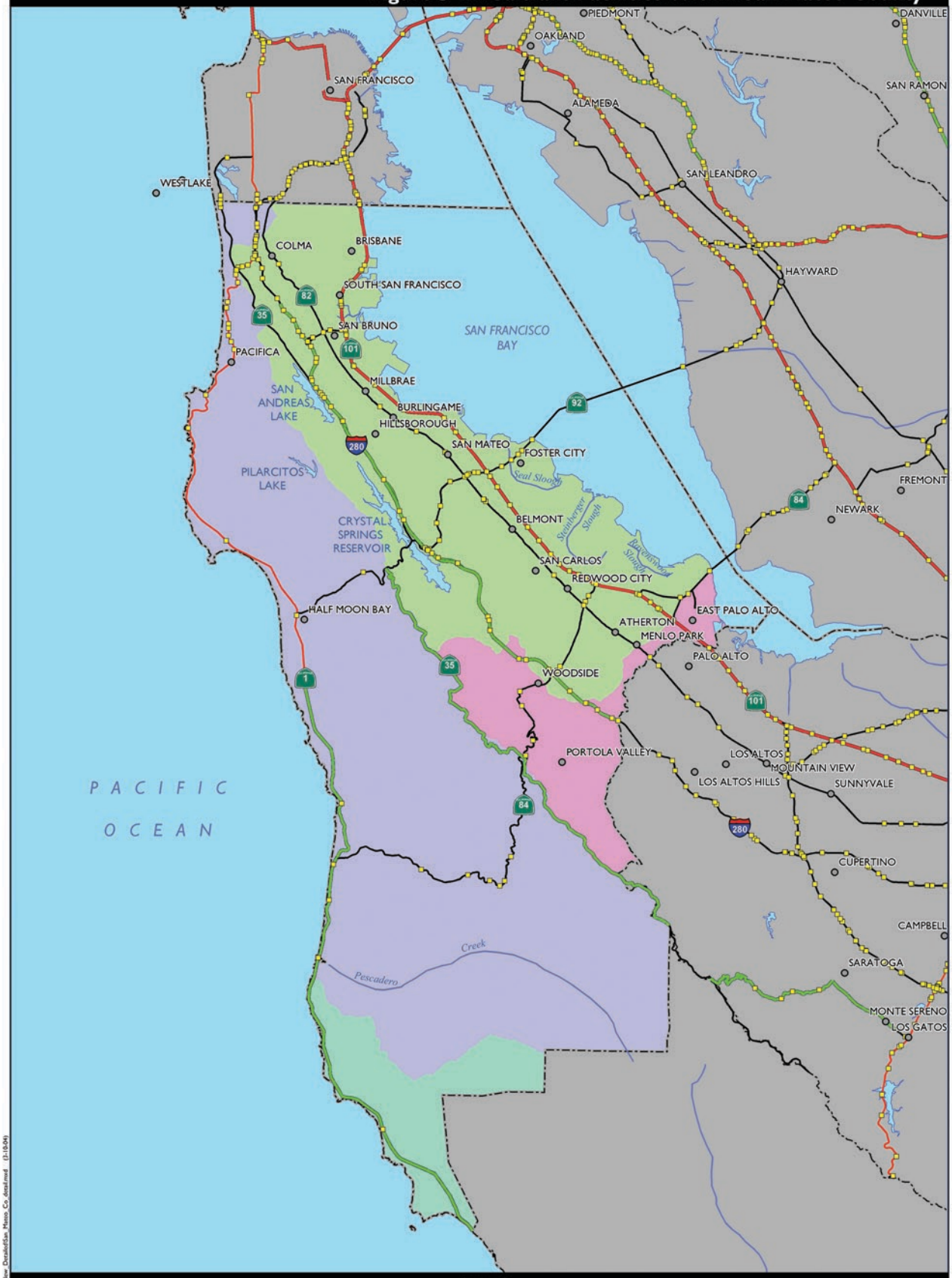


Figure 3-10: Caltrans Facilities Within San Mateo County



Legend

- Major State Highway
- State Highway
- Local Roadway
- Scenic Highway
- County Boundary
- Major Waterway
- Bridge Location
- City
- South Bay Watershed
- Santa Clara Watershed
- San Mateo Watershed
- Big Basin Watershed
- Surrounding Counties
- Body of Water

Note: Bridge data shows locations for bridges spanning hydrologic features as well as those spanning other features.

Source: Facilities data provided by Caltrans, 2004

0 2.5 5 Miles

0 5 10 Kilometers

N

Location Map

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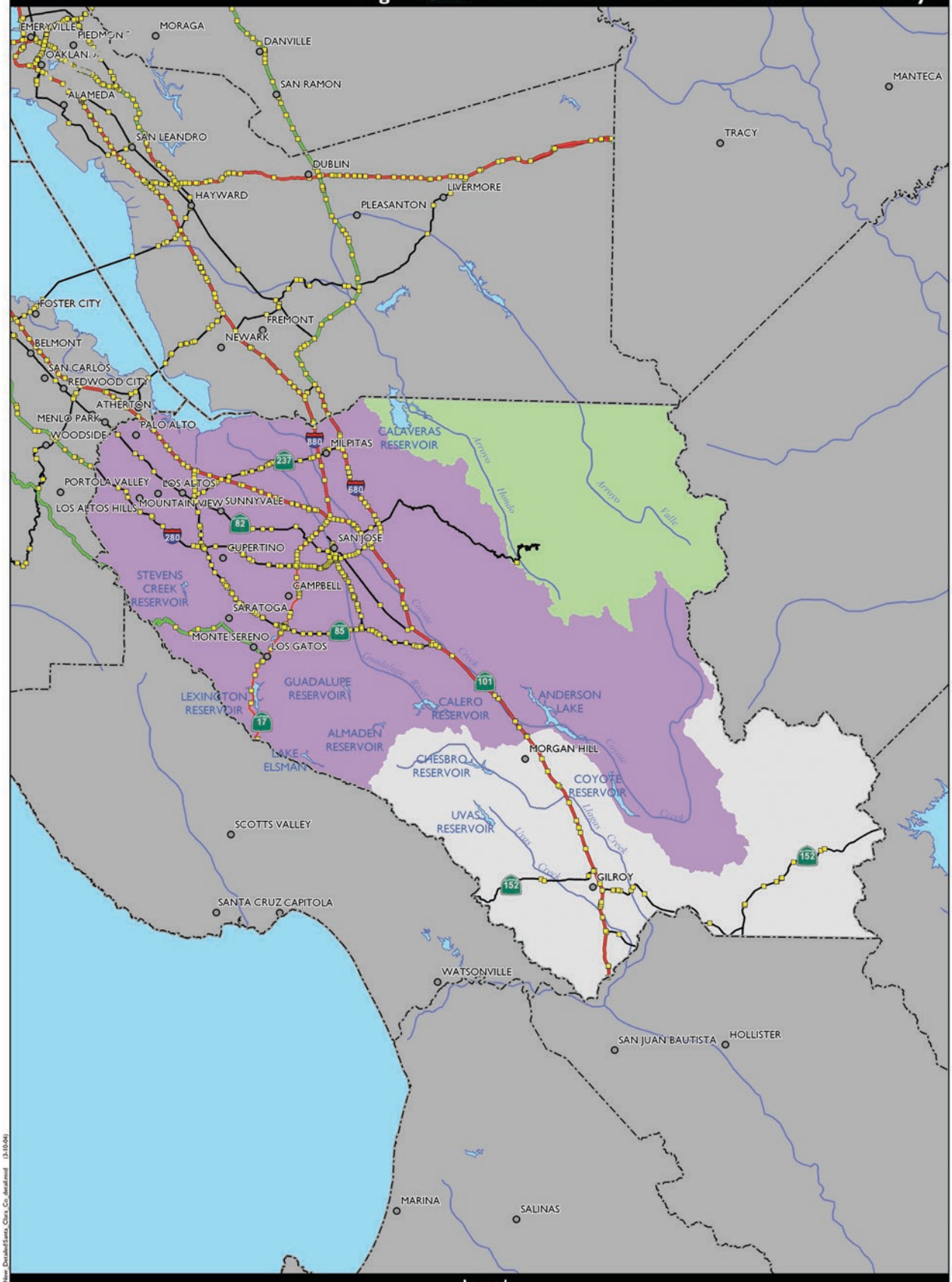
Figure 3-11 : Caltrans Facilities Within Santa Clara County



Legend

- Major State Highway
- State Highway
- Local Roadway
- Scenic Highway
- County Boundary
- Major Waterway
- Bridge Location
- City
- Santa Clara Watershed
- South Bay Watershed
- Not Included in Project Area
- Surrounding Counties
- Body of Water

Note: Bridge data shows locations for bridges spanning hydrologic features as well as those spanning other features.

Source: Facilities data provided by Caltrans, 2004

0 2.5 5 10 Miles

0 5 10 20 Kilometers

N

Location Map

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Figure 3-12: Caltrans Facilities Within Siskiyou County

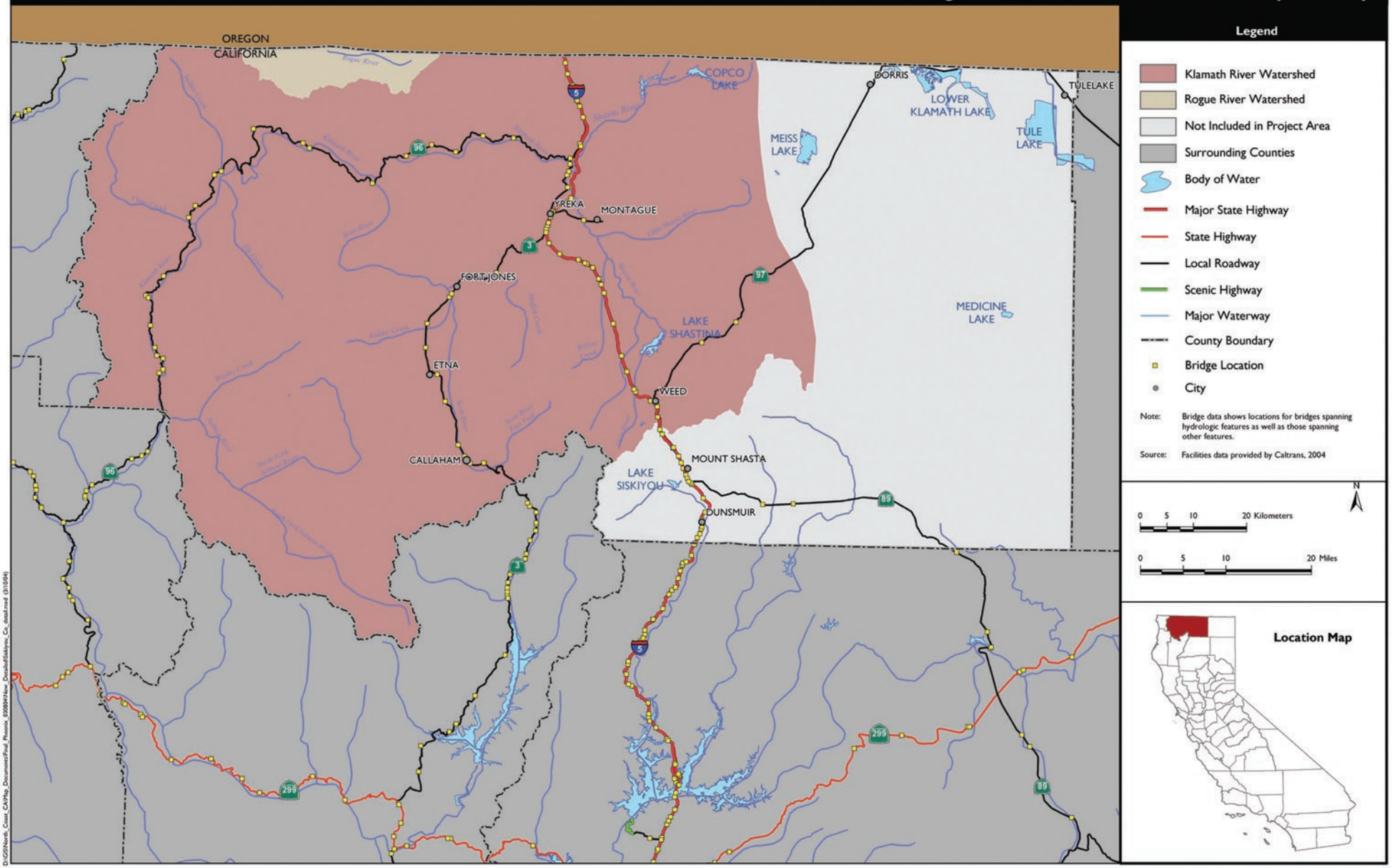
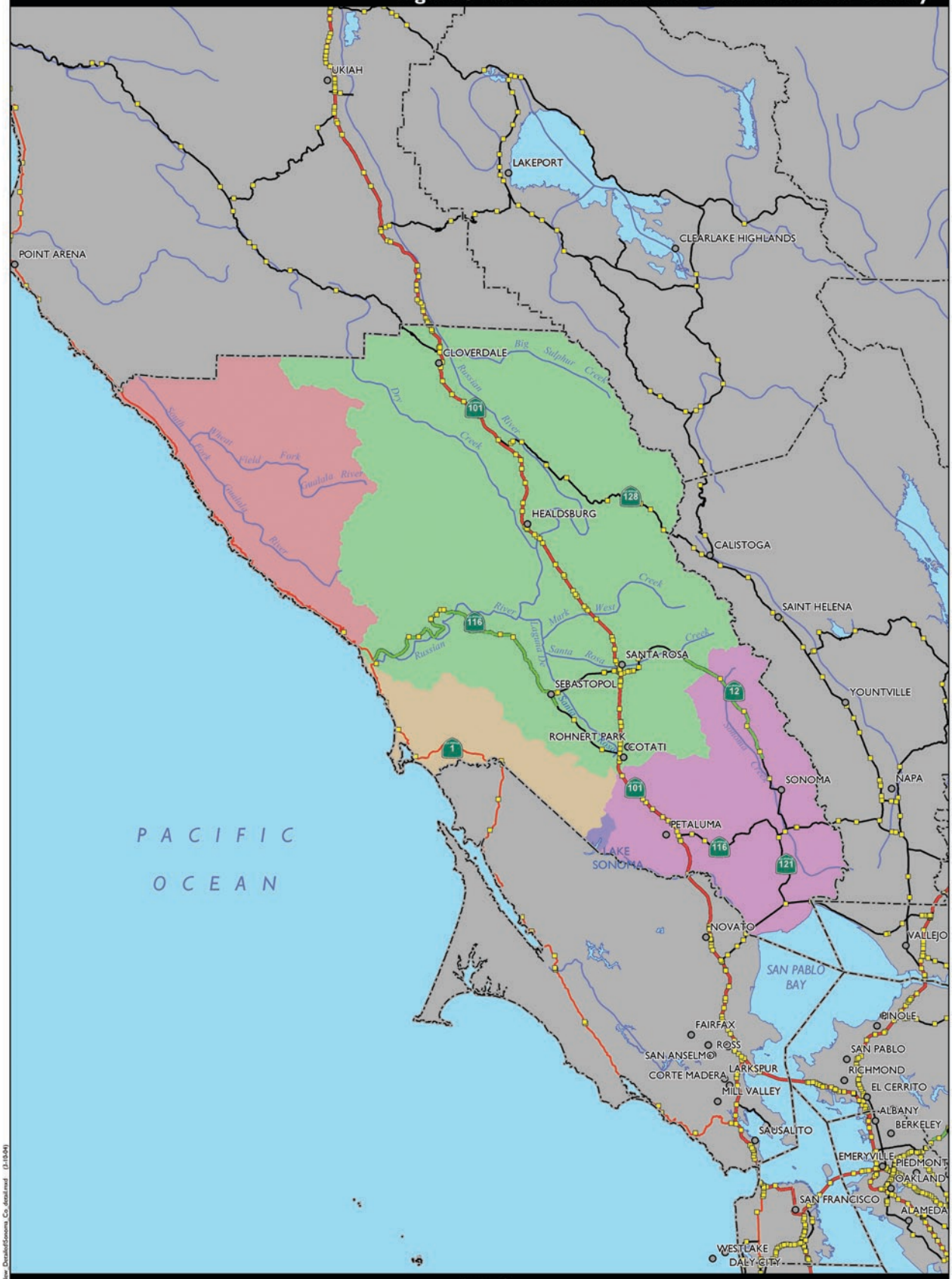


Figure 3-13: Caltrans Facilities Within Sonoma County



Legend

- Major State Highway
- State Highway
- Local Roadway
- Scenic Highway
- County Boundary
- Major Waterway
- Bridge Location
- City
- Bodega Watershed
- Marin Coastal Watershed
- Mendicino Coast Watershed
- Russian River Watershed
- San Pablo Watershed
- Surrounding Counties
- Body of Water

Note: Bridge data shows locations for bridges spanning hydrologic features as well as those spanning other features.

Source: Facilities data provided by Caltrans, 2004

0 2.5 5 10 Miles

0 5 10 20 Kilometers

N

Location Map

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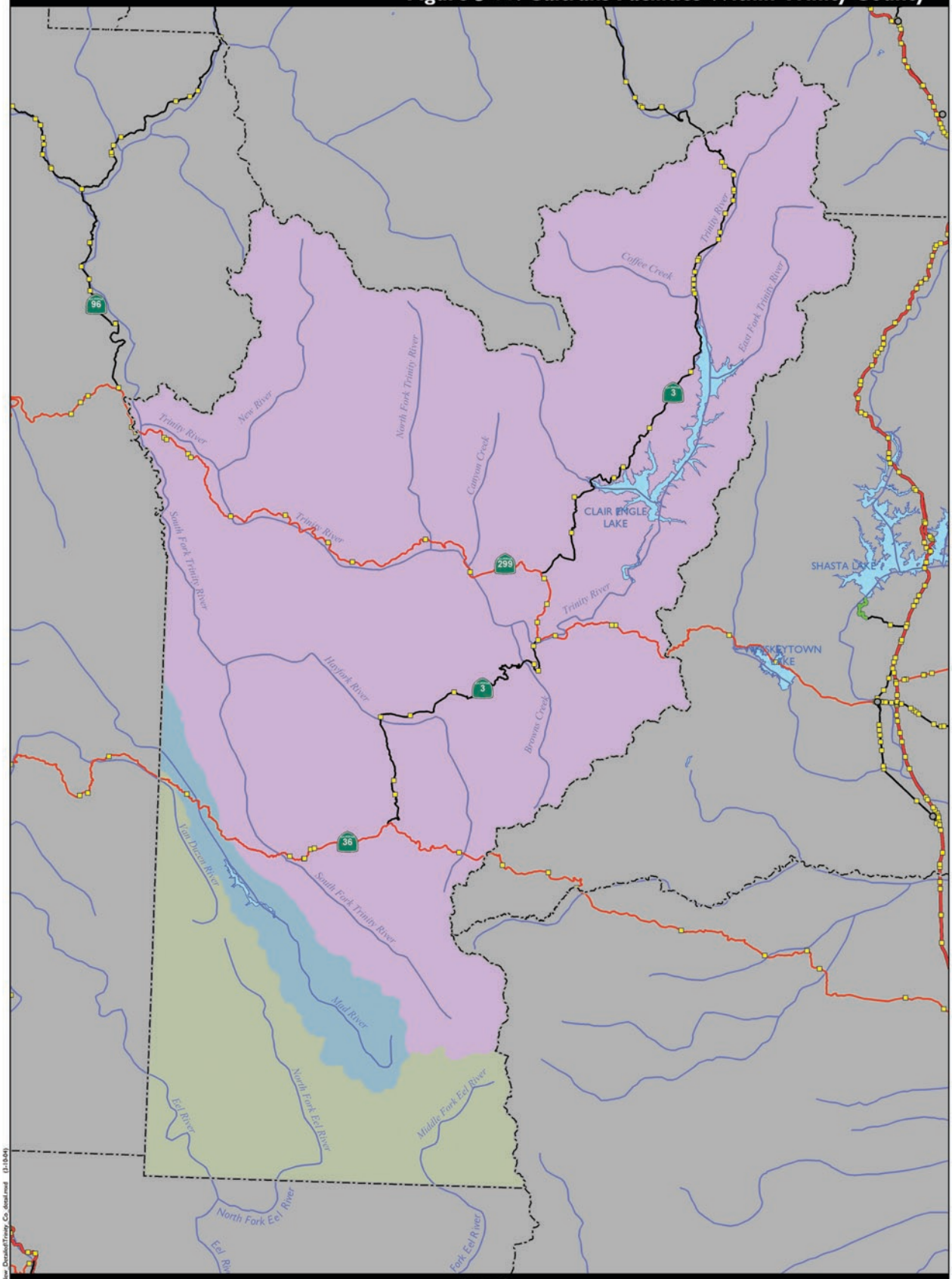
Figure 3-14: Caltrans Facilities Within Trinity County



Legend

- Major State Highway
- State Highway
- Local Roadway
- Scenic Highway
- County Boundary
- Major Waterway
- Bridge Location
- City
- Trinity River Watershed
- Mad River Watershed
- Eel River Watershed
- Surrounding Counties
- Body of Water

Note: Bridge data shows locations for bridges spanning hydrologic features as well as those spanning other features.

Source: Facilities data provided by Caltrans, 2004

0 2.5 5 10 Miles

0 5 10 20 Kilometers

Location Map

N

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Table 3-1. Relationship of California Watershed Regions to Caltrans Districts

Watershed Region	Caltrans District
North Coast	**1, 2, 4**
North Lahontan	2, 3, 10
Sacramento River	2, 3, 10
San Francisco Bay	**4**
Central Coast	**4**, 5, 6, 7
San Joaquin River	6, 10
Tulare Lake	6
South Coast	7, 11, 12
South Lahontan	8, 9
Colorado River	8, 11

3.2 North Coast

The north coast watershed includes all streams in California draining to the Pacific Ocean north of San Francisco Bay. North coast streams pass through or drain from the California coastal mountains. These are typically high-gradient streams with small estuaries. Watersheds are often rugged, with steep valley sides. Valleys are often heavily forested, especially in the upper elevations. All north coast watersheds have been affected by various human actions. The North Coast RWQCB summarizes information on conditions and management actions along the north coast. The Coastal Watershed Program website links to additional aquatic habitat and species information for north coast streams (http://www.ncwap.ca.gov).

3.2.1 Major River Systems

Major north coast river systems within the coverage area include the following:

- Smith River
- Klamath River
- Mad River
- Eel River
- Mattole River
- Ten Mile River
- Noyo River
- Garcia River
- Gualala River
- Russian River

3.2.2 Caltrans Districts

All of Caltrans District 1 outside Lake County, the northwestern edge of District 2, and the northwest portion of District 4 are situated in the north coast watershed (Figure 1-1).

3.2.3 Key Fish Species

Fish species under NMFS jurisdiction that are federally listed and occur within the covered area of the north coast include coho salmon, Chinook salmon, steelhead, green sturgeon, and eulachon. NMFS separates populations of salmon into ESUs or DPSs, based on factors such as life history, genetic distinctness, and location. Several salmon ESUs and steelhead DPSs are found in the north coast region. The Southern Oregon/Northern California coho salmon, California Coastal Chinook salmon, Central California Coast steelhead, and Northern California steelhead populations are all found in the north coast region and are listed as threatened under the ESA. Central California coho salmon are listed as endangered under the ESA and are present in north coast streams. Southern Oregon/Northern California Chinook salmon, Upper Klamath Chinook salmon, and Klamath Mountains Province steelhead also inhabit the north coast region, but are not listed as either threatened or endangered under the ESA or CESA. Salmon and steelhead may be present in north coast streams and rivers year-round.

3.3 San Francisco Bay

The San Francisco Bay watershed consists of San Francisco Bay and tributaries, the Sacramento River–San Joaquin River Delta, and coastal streams southward to Pescadero Creek (inclusive). The covered area for this PBA extends eastward to the Carquinez Strait. San Francisco Bay is the largest estuary on the west coast. It has been highly modified by extensive urbanization, diking and drainage of wetlands, and diversion of significant inflow from the Sacramento and San Joaquin Rivers. Despite extensive environmental degradation, San Francisco Bay and the Delta provide important habitat for protected estuarine resident species (e.g., delta smelt) and protected anadromous species (e.g., Chinook salmon, steelhead, green sturgeon, and Sacramento splittail). The California Bay-Delta Authority administers many activities in the San Francisco Bay region related to fish and their habitats, and the agency may be contacted for more information specific to this area.

3.3.1 Major Tributaries

Major tributaries to San Francisco Bay include the Sacramento and San Joaquin Rivers, which provide the major freshwater input to the bay. However, these rivers are not within the San Francisco Bay watershed or coverage area. Only coastal streams and streams that directly discharge to the bay are within the area of interest. Tributaries in the San Francisco Bay watershed that occur within the coverage area include the Petaluma, Napa, and Guadalupe Rivers.

3.3.2 Caltrans Districts

A large portion of Caltrans District 4 is located within the San Francisco Bay watershed (Figure 3-1).

3.3.3 Key Fish Species

Typical fish species in the San Francisco Bay and Delta areas are listed in Table 3-2. Anadromous salmonids federally listed as threatened in the region include Central Valley steelhead, Sacramento River winter-run Chinook salmon, and Central Valley spring-run Chinook salmon. Central California Coast coho salmon are federally listed as endangered in the region. Anadromous salmonids migrate through San Francisco Bay and the Delta during their out-migration to the ocean and during their upstream migration to spawn in the Sacramento and San Joaquin River systems and tributaries of the bay. Green sturgeon (Southern DPS) also occur in San Francisco Bay and coastal waters.

3.4 Central Coast

The central coast region encompasses coastal California from Pescadero Creek Lagoon in San Mateo County south to the Carpenteria salt marsh in Santa Barbara County. This region's environment consists of areas of coniferous/redwood forests in the Big Sur region in Monterey County and semi-arid to arid regions in San Luis Obispo, San Benito, Santa Cruz, and Santa Barbara Counties.

3.4.1 Major River Systems

No major river systems in the central coast watershed are within the coverage area. The coverage area only encompasses a minor portion of the watershed, which includes two small streams: Arroyo de los Frijoles and Gazos Creek.

3.4.2 Caltrans Districts

The southern section of Caltrans District 4 lies within the central coast region (Figure 3-1).

3.4.3 Key Fish Species

The central coast watershed provides habitat for listed species of salmon and steelhead. Federally endangered Central California Coast coho salmon occur along the coastline from Punta Gorda south to the San Lorenzo River, which includes the small portion of the central coast watershed encompassed by the coverage area. Federally threatened Central California Coast steelhead also occur in streams in the portion of the central coast watershed encompassed by the coverage area.

Table 3-2. Typical Fish Species in San Francisco Bay and Delta Areas

Common Name	Scientific Name
Yellowfin goby	*Acanthogobius flavimanus*
Whitebait smelt	*Allosmerus elongates*
American shad	*Alosa sapidissima*
Barred surfperch	*Amphistichus koelzi*
Topsmelt	*Atherinops affinis*
Jacksmelt	*Atherinopsis californiensis*
Speckled sanddab	*Citharichythys stigmaeus*
Arrow goby	*Clevelandia ios*
Pacific herring	*Clupea pallasi*
Shiner surfperch	*Cymotagaster aggregate*
Threadfin shad	*Dorosoma petense*
Black surfperch	*Embiotoca jacksoni*
Northern anchovy	*Engraulis mordax*
Threespine stickleback	*Gasterosteus aculeatus*
White croadker	*Genyonemus lineatus*
Walley surfperch	*Hyperprosopon argenteum*
Surf smelt	*Hypomesus pretiosus*
Diamond turbot	*Hypsopsetta guttalata*
Cheekspot goby	*Ilypnus gilberti*
Bay goby	*Lepidogobius Lepidus*
Pacific staghorn sculpin	*Leptocottus armatus*
Inland silverside	*Menidia beryllina*
Dwarf surfperch	*Micrometrus minimus*
Striped bass	*Morone saxatilis*
Brown smoothhound	*Mustelus henlie*
Bat ray	*Myliobatis califonica*
Chinook salmon	*Onchorhynchus tshawytscha*
Lingcod	*Ophiodon elongates*
California halibut	*Paralichthys califonicus*
English sole	*Parophrys vetulus*
Pacific pompano	*Peprilus simillimus*
White seaperch	*Phanerodon furcatus*
Starry flounder	*Platichthys stellatus*
Curlfin turbot	*Pleuronichthys decurrens*
Plainfin midshipman	*Porichthys notatus*
Sand fole	*Psettichthys melanosticus*
Big skate	*Raja binoculata*
Rubberlip seaperch	*Rhacochilus toxotes*
Pile perch	*Rhacochilus vacca*
Brown rockfish	*Sebastes auriculatus*
Longfin smelt	*Spirinchus thaleichthys*
California tonguefish	*Symphurus atricauda*
Bay pipefish	*Syngathus leptorhynchus*
Leopard shark	*Triakis semifasciata*
Chameleon goby	*Tridentiger trigonocephalus*

Chapter 4 Status and Potential Occurrences of Federally Listed Species under NMFS Jurisdiction in the Project Coverage Area

This chapter describes the federal status, distribution, and occurrences of each covered species under NMFS jurisdiction within the project coverage area. It also provides information on whether critical habitat has been designated for each species and whether a recovery plan has been completed. All status and distribution information was gathered from the NMFS protected resource website (http://www.nmfs.noaa.gov/pr/species/). Table 4-1 summarizes the distribution of each species within the counties and Caltrans districts of the project coverage area. Life history information on habitat requirements, seasonal activity, and ecological status is provided in Appendix A.

4.1 Fish

4.1.1 Eulachon----Southern DPS

- **Federally Listed Threatened Species**: Listed in 75 FR, 13012, March 18, 2010**.**
- **Critical Habitat:** None Designated
- **Recovery Plan:** Not applicable
- **Distribution in PBA Coverage Area**: Caltrans District 1

The southern DPS ranges from British Columbia down to the Mad River in Northern California. Some records exist in California south of the Mad River in Humboldt County, but the existence of self-sustaining populations south of the Mad River are not expected.

4.1.2 Chinook Salmon—California Coastal ESU

- **Federally Listed Threatened Species:** Originally listed in 64 Federal Register (FR) 50394, September 16, 1999; status reaffirmed in 70 FR 37160, June 28, 2005
- **Critical Habitat:** Designated in 70 FR 52488, September 2, 2005
- **Recovery Plan:** Final Recovery Plan Outline released in July 2007
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 2, 4

The ESU includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River to the Russian River in California, as well as seven artificial propagation programs: the Humboldt Fish Action Council (Freshwater Creek), Yager Creek, Redwood Creek, Hollow Tree, Van Arsdale Fish Station, Mattole Salmon Group, and Mad River Hatchery fall-run Chinook hatchery programs. The ESU and its designated critical habitat occur in Humboldt, Trinity, Mendocino, and Sonoma Counties within the coverage area.

Table 4-1. Distribution and Status of Fish Species Proposed for PBA Coverage

Common Name	Scientific Name	Federal Status	Caltrans District			County												
			1	2	4	Del Norte	*Humboldt*	Mendocino	Siskiyou	Trinity	Sonoma	Marin	San Francisco	San Mateo	Napa	Contra Costa	Alameda	Santa Clara
Fish																		
Chinook Salmon—California Coastal ESU	*Oncorhynchus tshawytscha*	T	X	X	X		X	X	X		X	X						
Chinook Salmon—Sacramento River Winter-Run ESU	*Oncorhynchus tshawytscha*	E	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Chinook Salmon—Central Valley Spring-Run ESU	*Oncorhynchus tshawytscha*	T	X	X	X	X	X	X	X	X				X		X	X	X
Coho Salmon—Central California Coast ESU	*Oncorhynchus kisutch*	E	X		X			X			X	X	X	X	X	X	X	X
Coho Salmon—Southern Oregon/Northern California Coast ESU	*Oncorhynchus kisutch*	T	X	X				X	X									
Steelhead—Northern California DPS	*Oncorhynchus mykiss*	T	X		X			X			X							
Steelhead—Central California Coast DPS	*Oncorhynchus mykiss*	T	X		X			X			X	X	X	X	X	X	X	X
Steelhead—California Central Valley DPS	*Oncorhynchus mykiss*	T	X	X		X	X	X	X	X								
Green Sturgeon—Southern DPS	*Acipenser medirostris*	T	X		X			X			X	X	X	X	X	X		X
Eulachon-Southern DPS	*Thaleicthys pacificus*	T			X	X												
Marine Mammals																		
Steller sea lion	*Eumetopias jubatus*	T	X		X	X	X	X			X	X	X	X				
Blue whale	*Balaenoptera musculus*	E	X		X	X	X	X			X	X	X	X				
Humpback whale	*Megaptera novaeangliae*	E			X							X	X	X				
Fin whale	*Balaenoptera physalus*	E	X		X	X	X	X			X	X	X	X				
Sei whale	*Balaenoptera borealis*	E	X		X	X	X	X			X	X	X	X				
Sperm whale	*Physeter macrocephalus*	E	X		X	X	X	X				X	X	X				
Marine Turtles																		
Leatherback turtle	*Dermochelys coriacea*	E	X		X			X			X	X	X	X				
Olive ridley turtle	*Lepidochelys olivacea*	E	X		X	X	X	X			X	X	X	X				
Loggerhead turtle	*Caretta caretta*	T	X		X			X			X	X	X	X				
Green turtle	*Chelonia mydas*	T,E	X		X			X			X	X	X	X				

Notes: DPS = Distinct Population Segment.
E = Endangered.
ESU = Evolutionarily Significant Unit.
T = Threatened.

4.1.3 Chinook Salmon—Sacramento River Winter-Run ESU

- **Federally Listed Endangered Species:** Originally listed in 59 FR 440, January 4, 1994; status reaffirmed in 70 FR 37160, June 28, 2005
- **Critical Habitat:** Designated in 58 FR 33212, June 16, 1993
- **Recovery Plan:** Public draft Recovery Plan released in October 2009.
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans District 4

The ESU includes all naturally spawned populations of winter-run Chinook salmon in the Sacramento River and its tributaries in California, as well as two artificial propagation programs: winter-run Chinook salmon from the Livingston Stone National Fish Hatchery (NFH), and winter-run Chinook salmon in a captive broodstock program maintained at Livingston Stone NFH and the University of California Bodega Marine Laboratory. The ESU occurs in a portion of Napa County within the coverage area, as well as in San Francisco Bay during migration. Designated critical habitat occurs in the Sacramento River up to Keswick Dam, all waters from Chipps Island west to the Carquinez Bridge, and in San Francisco and San Pablo Bays.

4.1.4 Chinook Salmon—Central Valley Spring-Run ESU

- **Federally Listed Threatened Species:** Originally listed in 64 FR 50394, September 16, 1999; status reaffirmed in 70 FR 37160, June 28, 2005
- **Critical Habitat:** Designated in 70 FR 52488, September 2, 2005
- **Recovery Plan:** Public draft of Central Valley Salmonid Recovery Plan released in October 2009
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans District 4

The ESU includes all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries in California, including the Feather River, as well as the Feather River Hatchery spring-run Chinook salmon program. The ESU occurs in a portion of Napa County within the coverage area, as well as in San Francisco Bay during migration. No critical habitat for this ESU occurs in the coverage area.

4.1.5 Coho Salmon—Central California Coast ESU

- **Federally Listed Endangered Species:** Originally listed as threatened in 61 FR 56138, October 31, 1996; status modified to endangered in 70 FR 37160, June 28, 2005
- **Critical Habitat:** Designated in 64 FR 24049, May 5, 1999
- **Recovery Plan: Public draft of** *Central California Coast Coho Recovery Plan released March 2010.***Distribution and Occurrence in PBA Coverage Area: Caltrans Distr**icts 1, 4

The ESU includes all naturally spawned populations of coho salmon from Punta Gorda in northern California south to (and including) the San Lorenzo River in central California, as well as populations in tributaries to San Francisco Bay, excluding the Sacramento–San Joaquin River system. It also includes four artificial propagation programs: the Don Clausen Fish Hatchery Captive Broodstock Program, Scott Creek/King Fisher Flats Conservation Program, Scott Creek

Captive Broodstock Program, and Noyo River Fish Station Egg-Take Program coho hatchery programs. The ESU occurs in Mendocino, Sonoma, Marin, San Francisco, and San Mateo Counties within the coverage area. Critical habitat includes all river reaches accessible to listed coho salmon from Punta Gorda in northern California to the San Lorenzo River in central California, including Arroyo Corte Madera del Presidio and Corte Madera Creek, which are tributaries to San Francisco Bay.

4.1.6 Coho Salmon—Southern Oregon/Northern California Coasts ESU

- **Federally Listed Threatened Species:** Originally listed in 62 FR 24588, May 6, 1997; status reaffirmed in 70 FR 37160, June 28, 2005
- **Critical Habitat:** Designated in 64 FR 24049, May 5, 1999
- **Recovery Plan:** Under development
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 2

The ESU includes all naturally spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California, as well as three artificial propagation programs: the Cole Rivers Hatchery (Oregon Department of Fish and Wildlife Stock #52), Trinity River Hatchery, and Iron Gate Hatchery coho hatchery programs. The ESU occurs in Del Norte, Siskiyou, Humboldt, Trinity, and Mendocino Counties within the coverage area. Critical habitat includes all river reaches accessible to listed coho salmon between Cape Blanco, Oregon, and Punta Gorda, California.

4.1.7 Steelhead—Northern California DPS

- **Federally Listed Threatened Species:** Originally listed in 65 FR 36074, June 7, 2000; status reaffirmed in 71 FR 834, January 5, 2006
- **Critical Habitat:** Designated in 70 FR 52488, September 2, 2005
- **Recovery Plan:** Under development
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 4

The DPS includes all naturally spawned anadromous populations below impassable natural and manmade barriers in California coastal river basins from Redwood Creek southward to (but not including) the Russian River, as well as two artificial propagation programs: the Yager Creek Hatchery and North Fork Gualala River Hatchery (Gualala River Steelhead Project) steelhead hatchery programs. The DPS and its critical habitat occur in Humboldt, Trinity, Mendocino, and Sonoma Counties within the coverage area.

4.1.8 Steelhead—Central California Coast DPS

- **Federally Listed Threatened Species:** Originally listed in 62 FR 43937, August 18, 1997; status reaffirmed in 71 FR 834, January 5, 2006
- **Critical Habitat:** Designated in 70 FR 52488, September 2, 2005
- **Recovery Plan:** Under development

- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 4

The DPS includes all naturally spawned anadromous steelhead populations below impassable natural and manmade barriers in California streams from the Russian River to Aptos Creek (both inclusive), and from the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers. It includes tributary streams to Suisun Marsh, including Suisun Creek, Green Valley Creek, and an unnamed tributary to Cordelia Slough (commonly referred to as Red Top Creek), excluding the Sacramento and San Joaquin Rivers**.** It also includes two artificial propagation programs: the Don Clausen Fish Hatchery and Kingfisher Flat Hatchery/Scott Creek (Monterey Bay Salmon and Trout Project) steelhead hatchery programs. The DPS occurs in Mendocino, Sonoma, Napa, Marin, San Francisco, San Mateo, Santa Clara, Alameda, and Contra Costa Counties within the coverage area. Riverine critical habitat occurs in the same counties, except San Francisco County. Critical habitat is also designated in San Francisco Bay.

4.1.9 Steelhead—California Central Valley DPS

- **Federally Listed Threatened Species:** Originally listed in 62 FR 43937, August 18, 1997; status reaffirmed in 71 FR 834, January 5, 2006
- **Critical Habitat:** Designated in 70 FR 52488, September 2, 2005
- **Recovery Plan:** Public draft released in October 2009
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans District 4

The DPS includes all naturally spawned anadromous steelhead populations below impassable natural and manmade barriers in California streams from the Russian River to Aptos Creek (both inclusive), and the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers. It includes tributary streams to Suisun Marsh, including Suisun Creek, Green Valley Creek, and an unnamed tributary to Cordelia Slough (commonly referred to as Red Top Creek), excluding the Sacramento and San Joaquin Rivers**.** It also includes two artificial propagation programs: the Coleman NFH and Feather River Hatchery steelhead hatchery programs. The ESU occurs in San Francisco Bay within the coverage area during migration. Critical habitat is present in San Francisco Bay.

4.1.10 Green Sturgeon—Southern DPS

- **Federally Listed Threatened Species:** Originally classified as a species of concern in 69 FR 19975, April 15, 2004; listed in 71 FR 17757, April 7, 2006
- **Critical Habitat:** Final critical habitat designated in 74 FR 52300, October 9, 2009
- **Recovery Plan:** In Process
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 4

Green sturgeon ranges from Mexico to Alaska in marine waters, and it is observed in bays and estuaries up and down the west coast of North America. The species congregates in estuarine environments, including non-natal estuaries. Currently, the spawning distribution of the southern DPS of green sturgeon includes the Sacramento River and its tributaries.

4.2 Marine Mammals

4.2.1 Steller Sea Lion

- **Federally Listed Threatened Species**: Listed in 55 FR 49204, November 26, 1990
- **Critical Habitat:** Designated in 58 FR 45269, August 27, 1993
- **Recovery Plans:** *Final Recovery Plan for Steller Sea Lions (Eumetopias jubatus)* (National Marine Fisheries Service 1992); *Draft Revised Steller Sea Lion Recovery Plan* (National Marine Fisheries Service 2007a)
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 4

The present range of Steller sea lion extends around the northern Pacific Rim from northern Japan to California. Steller sea lion rookeries in California are located at Año Nuevo Island, Southeast Farallon Island, Sugarloaf Island, and Cape Mendocino. In California, critical habitat includes all major Steller sea lion rookeries, as well as an air zone that extends 3,000 feet above areas (measured vertically from sea level) and an aquatic zone that extends 3,000 feet seaward in state- and federally managed waters from the baseline or basepoint of each major rookery. During fall and winter, many sea lions disperse from the rookeries and utilize haulouts at other terrestrial sites, with some animals, especially juveniles, traveling a considerable distance from their natal rookery.

4.2.2 Blue Whale

- **Federally Listed Endangered Species:** Listed in 35 FR 18319, December 2, 1970
- **Critical Habitat:** None designated
- **Recovery Plan:** *Recovery Plan for the Blue Whale (Balaenoptera musculus)* (National Marine Fisheries Service 1998a)
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 4

Blue whales live in all oceans of the world and prefer coastal shelf and oceanic waters. Every year, blue whales from the eastern North Pacific population feed in California waters from June to November before migrating to their winter feeding grounds off Mexico and the Costa Rica Dome. As of 2005, there were 1,744 blue whales in the eastern North Pacific population. They are found in the Channel Islands, Cordell Bank, Gulf of the Farallones, and Monterey Bay Marine Sanctuaries in California.

4.2.3 Humpback Whale

- **Federally Listed Endangered Species:** Listed in 35 FR 18319, December 2, 1970
- **Critical Habitat:** None designated
- **Recovery Plan:** *Final Recovery Plan for the Humpback Whale (Megaptera novaeangliae)* (National Marine Fisheries Service 1991)
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 4

Humpback whales utilize coastal and inland waters around the Pacific Rim. Whales found off the coast of California are most likely members of eastern North Pacific (California/Oregon/ Washington/Mexico) stock. These whales winter in coastal Central America and Mexico, and migrate to the coast of California and to southern British Columbia in summer and fall. Humpback whales have been sighted in the Sacramento River as far upstream as Rio Vista, including two injured whales in May 2007. However, these sightings are infrequent and outside the normal range of occurrence for humpback whales.

4.2.4 Fin Whale

- **Federally Listed Endangered Species:** Listed in 35 FR 18319, December 2, 1970
- **Critical Habitat:** None designated
- **Recovery Plan:** *Draft Recovery Plan for the Fin Whale* (*Balaenoptera physalus*) (National Marine Fisheries Service 2006a)
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 4

Fin whales utilize the immediate offshore waters during summer from central Baja California to Japan. They are present in central and southern California waters year-round, with numbers peaking in summer and fall. Off the coast of Oregon, their numbers peak in summer. There is some uncertainty surrounding the population structure of the fin whales found off the coast of California, but it appears that the stock migrates to an unknown location in winter and spring.

4.2.5 Sei Whale

- **Federally Listed Endangered Species:** Listed in 35 FR 18318, December 2, 1970
- **Critical Habitat:** Not designated
- **Recovery Plan:** Not applicable
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 4

Sei whales make use of both shelf and oceanic waters, but they are often distributed far out to sea in temperate regions and do not appear associated with coastal features. Sei whales are rare in California waters, although they were the fourth-most commonly caught whale by California whalers in the 1950s and 1960s.

4.2.6 Sperm Whale

- **Federally Listed Endangered Species:** Listed in 35 FR 18319, December 2, 1970
- **Critical Habitat:** None designated
- **Recovery Plan:** *Draft Recovery Plan for the Sperm Whale* (*Physeter macrocephalus*) (National Marine Fisheries Service 2006b)
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 4

Sperm whales tend to utilize water deeper than 1,968 feet and are rare in waters shallower than 984 feet. Sperm whales found off the coast of California are likely part of the California/Oregon/

Washington stock. Members of this population are found year-round in California waters, with peak abundance from April to mid-June and from the end of August to mid-November.

4.3 Marine Turtles

4.3.1 Leatherback Turtle

- **Federally Listed Endangered Species:** Listed in 35 FR 8491, June 6, 1970
- **Critical Habitat:** Designated in 44 FR 17710, March 23, 1979
- **Recovery Plan:** *Recovery Plan for the U.S. Pacific Populations of the Leatherback Turtle (Dermochelys coriacea)* (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998a)
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 4

Leatherback turtles are commonly known as pelagic animals, but also forage in coastal waters. In fact, leatherback turtles are the most migratory and wide-ranging of sea turtle species. There is no nesting by leatherback turtles on beaches under present or former United States Pacific jurisdiction**.** At-sea sightings in the United States Pacific are largely confined to the continental west coast. Critical habitat for the leatherback turtle is not found in the coverage area.

4.3.2 Olive Ridley Turtle

- **Federally Listed Endangered Species (**Mexico's Pacific Coast Breeding Colonies): Listed in 43 FR 32800, July 28, 1978
- **Federal Threatened Species (**Except Where Endangered): Listed in 43 FR 32800, July 28, 1978
- **Critical Habitat:** None designated
- **Recovery Plan:** *Recovery Plan for U.S. Pacific Populations of the Olive Ridley Turtle (Lepidochelys olivacea)* (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998b)
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 4

The olive ridley turtle is mainly a "pelagic" sea turtle, but has been known to inhabit coastal areas, including bays and estuaries. Olive ridley turtle numbers are so small within United States territorial waters that there has probably never been a directed harvest there. At sea, occurrences in the United States are limited to the west coast of the continental United States and Hawaii. Olive ridley turtle nesting occurs along continental margins and occasionally on oceanic islands. No nesting has been documented along the California coastline.

4.3.3 Loggerhead Turtle

- **Federally Listed Threatened Species:** Listed 43 FR 32800, July 28, 1978
- **Critical Habitat:** None designated

- **Recovery Plan:** *Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle* (*Caretta caretta)* (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998c)
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 4

Loggerhead turtles are found worldwide in the continental shelves, bays, estuaries, and lagoons throughout temperate and tropical regions. Loggerhead turtles are the most abundant species of sea turtle found in United States coastal waters. In the eastern Pacific Ocean, loggerhead turtles have been reported as far north as Alaska and as far south as Chile. In the United States, occasional sightings are reported from the coasts of Washington and Oregon, but most records are of juveniles off the coast of California. Nesting in the Pacific Basin is restricted to primarily Japan and Australia, with no nesting on the west coast of the United States.

4.3.4 Green Turtle

- **Federally Listed Endangered Species (Florida and Mexico Nesting Populations):** Listed in 43 FR 32800, July 28, 1978
- **Federal Threatened Species (Except Where Endangered):** Listed in 43 FR 32800, July 28, 1978
- **Critical Habitat:** Designated in 63 FR 46693, September 2, 1998
- **Recovery Plans:** *Recovery Plan for U.S. Pacific Populations of the Green Turtle (Chelonia mydas)* (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998d); *Recovery Plan for U.S. Pacific Populations of the East Pacific Green Turtle (*Chelonia mydas*)* (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998e)
- **Distribution and Occurrence in PBA Coverage Area:** Caltrans Districts 1, 4

Green turtles have been reported offshore of the west coast of the continental United States, but not in any pelagic waters under United States jurisdiction. There is no known green turtle nesting in the United States. Green turtles have been reported all along the Pacific coast of North America, making it the most commonly observed hard-shelled sea turtle along that portion of the United States coastline. The northernmost resident population of green turtles occurs in San Diego Bay, California, where they concentrate in the warm-water effluent discharged by the San Diego Gas & Electric Company power plant. These green turtles appear to have originated from nesting beaches in the eastern Pacific Ocean. Sightings of green turtles along the coast of California are most likely eastern Pacific Ocean green turtles. Critical habitat for green turtles is not located in the coverage area.

Chapter 5 Covered Activities

This chapter describes Caltrans routine repair and maintenance activities proposed for coverage in this PBA. These include:

- **CA-1:** Slide abatement and repair
- **CA-2:** Safety improvement
- **CA-3:** Drainage system maintenance, repair, and replacement
- **CA-4:** Bridge repair, retrofit, replacement, and maintenance
- **CA-5:** Maintenance planning

Each CA includes one or more SSPs and their associated PAs and BMPs that will be implemented to meet Caltrans' highway maintenance responsibilities. Detailed descriptions of each BMP are contained in Appendix C.

The frequencies that SSPs and PAs have been and are to continue to be implemented, as reported in the following tables and the Appendices, are estimates. Records that could have aided in generating a better estimate of the frequency that these actions have occurred in the past do not exist. The estimated numbers are purposely high, to be close to what could be expected after a winter with extreme rainfall and flooding, which typically generates high numbers of projects and maintenance responses. While overall project numbers are higher in high rainfall years, locations where work is needed depends on many variables including hydrographs, duration of rainfall, locations of particularly intense rainfall and upstream land management. Although some of the actions may be likely to adversely affect listed species, much of the work must be completed expeditiously to avoid the potential for substantial impacts to a variety of resources, including listed species. For example culverts must be replaced periodically to maintain fish passage and prevent damage to stream channel-associated habitats. The take of fish can occur during replacement even when BMPs are correctly employed. However, if the work is not implemented, serious failures can occur potentially causing much greater direct losses of listed fishes, delay in reaching spawning habitat and even elimination of spawning and rearing - production opportunities.

5.1 Description of Covered Activities

Detailed descriptions of the proposed CAs and their constituent SSPs and PAs are presented below. PAs that are required to implement SSPs will vary with project location and conditions. Not all SSPs will require each of the PAs identified, and determining which PAs will be required for a specific SSP will occur on a case-by-case basis.

CA-1: Slide Abatement and Repair

Slide abatement and repair includes 1) removal of slide and alluvial debris and soil from existing roadways, road shoulders, and adjacent side slopes when they pose a potential hazard to motorists; 2) stabilization of slopes to avoid or minimize debris slides and potential damage to

roadways; and 3) stabilization of streambanks and channels to avoid or minimize erosion and potential damage to roadways, bridges, and culverts. These activities are typically undertaken to ensure the continued safe use of existing infrastructure managed by Caltrans. The following SSPs can occur as part of this CA. The lists following each SSP description identify the PAs that may be required to complete the SSP. The lists are comprehensive, although not every PA will be required for every SSP, and which PAs will be required will be determined on a case-by-case basis.

SSP-1.1: Removal of Slide and Alluvial Debris and Soil from Roadways, Road Shoulders, and Side Slopes

Substantial sediment and debris may be deposited on roadways by side slope failure and high streamflow. Caltrans removes these materials from the roadways to maintain road function, provide motorist safety, protect water quality, ensure drainage, and protect infrastructure. Materials outside the roadway or ditch slopes that are unstable and constitute potential slides, materials from slides that have come into the roadway or ditch, and materials that have slipped out of new or old embankments are excavated and removed to Caltrans gravel pits and approved waste material repositories. Where needed, soils from the failing road shoulders/slopes below highway and ditch slopes are removed to reestablish the structural integrity of these areas. During this process, sediment may also be tracked onto the roadways by movement of construction and hauling equipment and must be removed.

Equipment required to complete this SSP will depend upon the scale of the material that must be removed, but in general a front-end loader, bulldozer, backhoe, and dump trucks will be required, as well as pickup trucks. A vibratory pile driver may also be required to complete this SSP if sheet piling is installed as temporary or permanent slope protection. A vibratory pile driver may be used in upland areas only. No in-water pile driving activities are covered under this PBA. The equipment will generally operate from the road prism, although in rare instances equipment may be required to operate outside the developed road prism to remove material and stabilize adjacent slopes. Equipment/vehicle operation will not occur in sensitive habitats such as surface waters or wetlands.

The area affected by this SSP will vary depending upon the scale of the material that is present on the roadway and that must be removed. The area affected will generally include the managed road prism/right-of-way. The area affected could, however, include sensitive habitats such as surface waters or wetlands.

Table 5-1 below provides the annual frequency for SSP-1.1 by Caltrans District, within the coverage area.

Table 5-1. Annual Frequency of SSP-1.1 per Caltrans District

Site-Specific Project	Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-1.1: Removal of slide and alluvial debris and soil from roadways, road shoulders, and side slopes	35	10	40

Depending on the magnitude of the debris and soil deposition, the PAs required to complete this SSP may include all or some of the following PAs (the actual PAs will be determined on a case-by-case basis):

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-11:** Grade and establish temporary and permanent staging/storage areas for sediment, debris, and construction materials and equipment
- **PA-13:** Grade temporary access roads and traffic detours
- **PA-15:** Construct temporary stream crossings
- **PA-20:** Install permanent and temporary rock slope protection (RSP), sheet piles, and retaining walls
- **PA-27:** Blast rock and other substrate
- **PA-29:** Implement BMPs

SSP-1.2: Stabilization of Side Slopes to Minimize Debris Slides and Damage to Roads

The purpose of stabilizing side slopes is to minimize erosion and slope failure that could damage roads and other infrastructure, and to stabilize or support the roadway. Replacement and installation of new RSP and other stabilizing measures on hill slopes reduces future maintenance and repair activities that could be required to repair and replace lost infrastructure, and that could adversely affect listed species and habitat.

Equipment required to complete this SSP will depend upon the scale of the side slopes that require stabilization, but in general a front-end loader, bulldozer, backhoe, and dump trucks will be required, as well as pickup trucks. A vibratory pile driver may be required if temporary or permanent side slope protection is required. The equipment will operate from the road prism, although in rare instances equipment may be required to operate outside of the developed road prism to stabilize adjacent slopes. Equipment/vehicle operation will not be required in surface waters or sensitive habitats (e.g., wetlands).

The area affected by this SSP will vary depending upon the scale of the side slopes that must be stabilized. The area affected will include upland slopes adjacent to managed road prism/right-of way.

Table 5-2 below provides the annual frequency for SSP-1.2 by Caltrans District, within the coverage area.

Table 5-2. Annual Frequency of SSP-1.2 per Caltrans District

Site-Specific Project	Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-1.2: Stabilization of side slopes to minimize erosion and damage to adjacent roads, bridges, and culverts	30	10	20

PAs used in this SSP include the following:

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-11:** Grade and establish temporary and permanent staging/storage areas for sediment, debris, and construction materials and equipment
- **PA-13:** Grade temporary access roads and traffic detours
- **PA-15:** Construct temporary stream crossings
- **PA-20:** Install permanent and temporary rock slope protection (RSP), sheet piles, and retaining walls
- **PA-27:** Blast rock and other substrate
- **PA-29:** Implement BMPs

SSP-1.3: Stabilization of Streambanks and Channels to Minimize Erosion and Damage to Adjacent Roads, Bridges, and Culverts

The purpose of stabilizing streambanks and channels is to minimize erosion and streambank failure that could damage roads, bridges, culverts, and other infrastructure. Stabilizing streambanks reduces potential subsequent repair activities that could be required to repair and replace lost infrastructure, and that could adversely affect listed species and habitat.

Completion of this SSP may require such equipment as backhoes, bulldozers, dump trucks, and pickup trucks, as well as hand held power tools and hand tools such as shovels. A vibratory pile driver will be required if installation of temporary or permanent sheet piling is required to

stabilize streambanks. The equipment operates from the road prism, although in rare instances equipment may be required to operate outside of the developed road prism to stabilize adjacent slopes. Equipment/vehicle operation is not typically required in surface waters or sensitive habitats (e.g., wetlands, streams, rivers), although operation within such habitats may be unavoidable to complete an SSP in a timely manner or to reduce impacts on riparian vegetation or other terrestrial or aquatic species, habitats, or resources.

The area affected by this SSP will vary depending upon the extent of the streambank or channel that is located adjacent to a road, bridge or culvert. However, for the PBA the length of streambank or channel affected is not expected to exceed 500 linear feet. The area affected will be dependent upon the size of the stream and the PAs required to complete this SSP. PAs that could potentially result in impacts on surface waters are PA-7, PA-14 through PA-19, and PA-28. Should all these PAs be required, the length of stream channel affected is not expected to exceed 500 linear feet. It is difficult to determine the square footage of the affected area at the programmatic level due to the variety of streams and rivers that could be affected, which could range from 5 to 50 feet in width. Typically, these projects are repairs of existing installations.

Table 5-3 below provides the annual frequency for SSP-1.3 by Caltrans District, within the coverage area.

Table 5-3. Annual Frequency of SSP-1.3 per Caltrans District

Site-Specific Project	Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-1.3: Stabilization of streambanks and channels to minimize erosion and damage to adjacent roads, bridges, and culverts	30	10	20

PAs used in this SSP include the following:

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-7:** Treat and discharge water conveyed from the construction area
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-11:** Grade and establish temporary and permanent staging/storage areas for sediment, debris, and construction materials and equipment
- **PA-13:** Grade temporary access roads, traffic detours, and staging and work areas

- **PA-14:** Operate construction equipment and vehicles in the stream channel
- **PA-**15: Construct temporary stream crossings
- **PA-16:** Remove and disturb aquatic vegetation, stream sediment, and LWD
- **PA-17:** Install temporary cofferdams and diversion cofferdams
- **PA-18:** Temporarily redirect stream flow
- **PA-19:** Temporarily draft water from streams and other water bodies
- **PA-20:** Install permanent and temporary rock slope protection (RSP), sheet piles, and retaining walls
- **PA-28:** Capture, handle, exclude, salvage, and relocate listed species
- **PA-29:** Implement BMPs
- **PA-30:** Mitigation framework for potential adverse impacts on species listed under CESA

CA-2: Safety Improvement

Safety improvements include activities intended to prolong the life of a roadway, provide safety to motorists, and provide information to motorists (e.g., speed limits, upcoming exits and interchanges, hazards). The following SSPs are proposed for coverage as part of this CA. The lists following each SSP identify those PAs that may be required to complete the SSP. The lists are comprehensive, but not every potential PA will be utilized in every SSP.

SSP-2.1: Maintenance, Repair, and Replacement of Asphalt, Concrete, and Other Construction Materials on Roads and Other Infrastructure

Road and bridge surfaces degrade over time in response to the initial design of the pavement, based on anticipated traffic volumes and loads, cumulative traffic volume (especially truck traffic), and environmental factors such as moisture infiltration and heat and cold cycles. Repair and replacement of road surfaces is necessary to maintain the function and safety of roads and bridges.

Paving projects involve patching, repairing, and replacing roadway surfaces and pavements. Caltrans maintains several thousand miles of paved highway in those portions of Districts 1, 2, and 4 within the PBA coverage area. Each section of highway paved with asphalt or concrete must be repaved every 10 to 14 years. If the existing pavement is in good condition, it may be covered over with a new layer of asphalt, but badly deteriorated pavement requires the replacement of the foundation material. This typically involves grinding off and replacing the existing asphalt pavement. The ground-off pavement is usually recycled and used to make new asphalt pavement.

Rehabilitation of small damaged pavement areas often requires “chipsealing”—the addition of hot tar and a layer of small rocks placed on the existing asphalt or concrete paving. This process involves the use of an asphalt plant area where hot liquid asphalt oil is mixed with crushed rock to produce the new asphalt. A rock crusher is also often required at or near the site. When the project is very large or very far from a commercial plant, a portable asphalt plant may be set up in a gravel pit or other staging area near the site.

Equipment required to complete this SSP will depend upon the scale of the segment of roadway or infrastructure element that will require maintenance, repair or replacement of asphalt, concrete or other construction materials, but in general a front-end loader, bulldozer, backhoe, dump trucks, pavement removal equipment and pavement laying equipment will be required to complete this SSP, as well as pickup trucks. Equipment/vehicle operation will not be required in surface waters or sensitive habitats (e.g., wetlands).

The area affected by this SSP will vary depending upon the scale of the segment of roadway or infrastructure element that must be maintained, repaired or replaced. The area affected will include the existing roadway or infrastructure within the managed road prism/right-of way. This SSP will not include operation of equipment or work beyond the existing right-of-way or within sensitive habitats such as surface waters or wetlands.

Table 5-4 below provides the annual frequency for SSP-2.1 by Caltrans District, within the coverage area.

Table 5-4. Annual Frequency of SSP-2.1 per Caltrans District

Site-Specific Project	Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-2.1: Maintenance, repair, and replacement of asphalt, concrete, and other construction materials on roads and other infrastructure	60	30	80

PAs used in this SSP include the following:

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-6:** Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure
- **PA-9:** Paint, wash, seal, and caulk bridges, guardrails, and other infrastructure
- **PA-29:** Implement BMPs

SSP-2.2: Installation and Replacement of Signs

Signs are needed for road safety and motorist information. Signs are installed when existing signs deteriorate or are destroyed, and when previously unrecognized safety concerns become apparent. Routine road maintenance and other covered construction activities may also require

the replacement and installation of road and highway signs. Installation of very large signs, including concrete footings and steel supports, potentially disturbs substantial areas. Trenching may be required to run utilities from existing sources to lighted signs.

Equipment/vehicles required to complete this SSP may include pickup trucks, hauling trucks, backhoe, trencher, drilling rigs/augers, paver, rollers, concrete saw, jackhammer, and other hand-held power tools. Equipment/vehicle operation will not be required in surface waters or sensitive habitats (e.g., wetlands). No drilling lubricants will be required (PA-8). Augers are relatively small and do not require the use of lubricants for this SSP.

The area affected by this SSP will vary depending upon the scale of the signage to be installed or replaced, but in general the area will not exceed 200 square feet. The area affected will be confined to the existing road prism/right-of-way. This SSP will not include operation of equipment or work beyond the existing right-of-way, particularly work within sensitive habitats such as surface waters or wetlands.

Table 5-5 below provides the annual frequency for SSP-2.2 by Caltrans District, within the coverage area.

Table 5-5. Annual Frequency of SSP-2.2 per Caltrans District

Site-Specific Project	Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-2.2: Installation and replacement of signs	200	50	200

PAs used in this SSP include the following:

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-6:** Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure
- **PA-8:** Use drill rigs and drilling lubricants
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-29:** Implement BMPs

SSP-2.3: Installation and Replacement of Guardrails

Guardrails are needed for road safety and to protect infrastructure, property, and other features adjacent to the roadway. Railings and barriers are used to reduce the potential for severity of accidents resulting from vehicles leaving the road, prevent out-of-control vehicles from crossing the median, and decelerate errant vehicles.

Equipment/vehicles required to complete this SSP may include pickup trucks, hauling trucks, backhoe, trencher, drilling rigs/augers, concrete saw, jackhammer, and other hand-held power tools. Equipment/vehicle operation will not be required in surface waters or sensitive habitats (e.g., wetlands). No drilling lubricants will be required (PA-8). Augers are relatively small and do not require the use of lubricants for this SSP.

The area affected by this SSP will vary depending upon the scale of the guardrail to be installed or replaced. The area affected will be confined to include only the existing road prism/right-of-way. This SSP will not include operation of equipment or work beyond the existing right-of-way, particularly work within sensitive habitats such as surface waters or wetlands.

Table 5-6 below provides the annual frequency for SSP-2.3 by Caltrans District, within the coverage area.

Table 5-6. Annual Frequency of SSP-2.3 per Caltrans District

Site-Specific Project	Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-2.3: Installation and replacement of guardrails	30	30	30

PAs used in this SSP include the following:

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-6:** Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure
- **PA-8:** Use drill rigs and drilling lubricants
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-29:** Implement BMPs

CA-3: Drainage System Maintenance and Repair

Drainage system maintenance and repair includes maintenance and repair to channels, ditches, culverts, and bridges to ensure conveyance of surface waters, ensure fish passage, and avoid erosion of infrastructure, adjacent features, and private property. The following SSPs are proposed for coverage as part of this CA. The lists following each SSP description identify those PAs that may be required to complete the SSP. The lists are comprehensive, but not every potential PA will be utilized in every SSP.

SSP-3.1: Cleaning of Drainage Channels and Ditches to Maintain Function and Avoid Damage to Adjacent Roads

Drainage channels, ditches, and associated components are generally man-made features that on occasion could contain fish. These facilities are cleaned periodically to permit free streamflow and to avoid erosion and damage to roads and other infrastructure. Excavation of debris and sediment from ditches, channels, and detention or retention basins requires minor grading along ditches and at storm drain outfalls and inlets. Ditches and channels often require cleaning or grading when standing water is on the road shoulder or if deposits fill more than 50% of the capacity of the retention/detention basin. Retention or detention basins require periodic maintenance to preserve the line, grade, depth, and cross section to which they were originally designed.

Debris and accumulated sediment is removed by manual cleaning methods or by using a backhoe or a vacuum truck. Solids are stored on Caltrans property, tested, and disposed of at an approved disposal facility or recycled as fill material if suitable. In some cases, especially larger streams or streams where it is beneficial to retain stream sediments and woody debris in the system or is logistically efficient, some or all of the material is deposited in the channel but downstream of the culvert or bridge. Liquids may be decanted at an approved decanting facility where Caltrans use is approved. Where approval has not been granted, decanted material may be reintroduced only when other practical means are not available and only to catch basins remote from the discharge point.

Equipment/vehicles required to complete this SSP may include pickup trucks, backhoes, vacuum trucks, hauling trucks, and hand-held tools such as shovels and rakes. The equipment generally operates from the road prism, although in rare instances equipment may be required to operate outside of the developed road prism to stabilize slopes adjacent to the roadway.

Equipment/vehicle operation is not typically required in surface waters or sensitive habitats (e.g., wetlands), although at times operation within such habitats may be required to complete an SSP in a manner that may reduce impacts on riparian vegetation or other terrestrial species, habitats, or resources.

The length of drainage channel or ditch affected by this SSP will vary depending upon the scale of the feature to be cleaned. However, the length is not expected to exceed 500 linear feet. The extent of the area affected will be dependent upon the size of the drainage channel or ditch and the PAs required to complete this SSP. PAs that could potentially result in impacts on surface waters are PA-7, PA-14, PA-16 through PA-19, and PA-28. It is difficult to determine the square footage of the affected area of drainage channels and ditches at the programmatic level due to the

variety of these features that could be affected, which could range from 1 foot to 10 feet in width (e.g., area affected could range from 500 square feet to 5,000 square feet).

Table 5-7 below provides the annual frequency for SSP-3.1 by Caltrans District, within the coverage area.

Table 5-7. Annual Frequency of SSP-3.1 per Caltrans District

Site-Specific Project	Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-3.1: Clearing of drainage channels and ditches to maintain function and avoid damage to adjacent roads	15	10	40
	3 fish bearing streams	2 fish bearing streams	8 fish bearing streams

PAs used in this SSP include the following:

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-7:** Treat and discharge water conveyed from the construction area
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-11:** Grade and establish temporary and permanent staging/storage areas for sediment, debris, and construction materials and equipment
- **PA-13:** Grade temporary access roads and traffic detours
- **PA-14:** Operate construction equipment and vehicles in the stream channel
- **PA-16:** Remove and disturb aquatic vegetation, stream sediment, and LWD
- **PA-17:** Install temporary cofferdams and diversion cofferdams
- **PA-18:** Temporarily redirect stream flow
- **PA-19:** Temporarily draft water from streams and other water bodies
- **PA-28:** Capture, handle, exclude, salvage, and relocate listed species
- **PA-29:** Implement BMPs
- **PA-30:** Mitigation framework for potential adverse impacts on species listed under CESA

SSP-3.2: Cleaning of Sediment and Debris from Culverts and Bridge Abutments and Supports to Minimize Erosion and Damage to Roads, Culverts, and Bridges and to Maintain Streamflow Conditions

Culverts; box culverts; bridge piers, abutments, and supports; and the adjacent stream channel are cleaned of sediment and debris to provide sufficient depth and grade to ensure designed streamflow under the roadway and in the affected stream channel. Debris and drift is also removed from bridge piers, bearing seats, and abutments**.**

Equipment/vehicles required to complete this SSP may include pickup trucks, cranes, backhoes, vacuum trucks, hauling trucks, chainsaws, and hand-held tools such as shovels and rakes. The equipment generally operates from the road prism or other infrastructure, such as bridges, although in rare instances equipment may be required to operate outside of the developed road prism to remove sediment and debris from culverts or bridge abutments and supports. Equipment/vehicle operation is not typically required in surface waters or sensitive habitats (e.g., wetlands), although at times operation within such habitats may be required to complete this SSP in a timely manner or to reduce impacts on riparian vegetation or other terrestrial and aquatic species, habitats, or resources.

The length of stream channels affected by this SSP will vary depending upon the scale of the sediment and debris to be cleaned and removed, but is not expected to exceed 50 linear feet in most cases. However, the area affected is difficult to estimate due to the variance in widths of channels where this SSP may be implemented, which could range from 1 foot to 100 feet in width (e.g., area affected could range from 50 square feet to 5,000 square feet).. The extent of the area affected will be dependent upon the size of the stream and the PAs required to complete this SSP. PAs that will result in impacts on surface waters are PA-7, PA-14, PA-16 through PA-19, PA-23, and PA-28. Should all of these PAs be required, the length of stream channel affected is not expected to exceed 50 linear feet. This SSP is typically (approximately 90% of the time) applied to the cleaning of sediment and debris from culverts. Most of these culverts are non-fish-bearing. However, these features may discharge to a fish-bearing water, and activities within these features could affect fish-bearing waters

Table 5-8 below provides the annual frequency for SSP-3.2 by Caltrans District, within the coverage area.

Table 5-8. Annual Frequency of SSP-3.2 per Caltrans District

Site-Specific Project		Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-3.2: Cleaning of sediment and debris from culverts and bridge abutments and supports to minimize erosion and damage to roads, culverts and bridges and to maintain streamflow conditions	Total	8,000*	350*	9,000*
	In fish-bearing streams when wet	55	70	4

*The vast majority of the estimated annual frequency of this SSP involves low-impact activities. Most of the cleaning involves removal of sticks and leaves from culvert inlets and removal of very small amounts of sediment (3–4 shovelsful on average). Most of this type of work is done by hand, usually after the first couple of storms each year.

PAs used in this SSP include the following:

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-7:** Treat and discharge water conveyed from the construction area
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-11:** Grade and establish temporary and permanent staging/storage areas for sediment, debris, and construction materials and equipment
- **PA-13:** Grade temporary access roads and traffic detours
- **PA-14:** Operate construction equipment and vehicles in the stream channel
- **PA-16:** Remove and disturb aquatic vegetation, stream sediment, and LWD
- **PA-17:** Install temporary cofferdams and diversion cofferdams
- **PA-18:** Temporarily redirect stream flow
- **PA-19:** Temporarily draft water from streams and other water bodies
- **PA-23:** Clean, retrofit, or install culverts
- **PA-28:** Capture, handle, exclude, salvage, and relocate listed species
- **PA-29:** Implement BMPs
- **PA-30:** Mitigation framework for potential adverse impacts on species listed under CESA

SSP-3.3: Rehabilitation of Culverts to Maintain Function

Culverts may be damaged by storm events, debris, and cleaning activities. Damage to an extent that impairs function or that may result in erosion and damage to the roadway could require rehabilitation.

Equipment/vehicles required to complete this SSP may include pickup trucks, cranes, backhoes, hauling trucks, chainsaws, and hand-held tools such as shovels and rakes. The equipment operates from the road prism, although equipment may be required to operate outside of the developed road prism to complete this SSP. Equipment/vehicle operation is not typically required in surface waters or sensitive habitats (e.g., wetlands), although at times operation within such habitats may unavoidable.

The area affected by this SSP will vary depending upon the scale of the culvert rehabilitation effort and the size of the stream. However, the length of stream affected is not expected to

exceed 100 linear feet of channel. The extent of the area affected will be dependent upon the PAs required to complete this SSP. PAs that will result in impacts on surface waters are PA-7, PA-14, PA-16 through PA-19, PA-21 through PA-24, and PA-28. Should all of these PAs be required, the affected area will not exceed 100 linear feet of drainage channel or ditch. It is difficult to determine the square footage of the affected area at the programmatic level due to the variety of drainage channels and ditches that could be affected, which could range from 1 to 10 feet in width (e.g., area affected could range from 100 to 1,000 square feet).

Table 5-9 below provides the annual frequency for SSP-3.3 by Caltrans District, within the coverage area.

Table 5-9. Annual Frequency of SSP-3.3 per Caltrans District

Site-Specific Project	Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-3.3: Rehabilitation of culverts to maintain function	30	30	30

PAs used in this SSP include the following:

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-7:** Treat and discharge water conveyed from the construction area
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-11:** Grade and establish temporary and permanent staging/storage areas for sediment, debris, and construction materials and equipment
- **PA-13:** Grade temporary access roads and traffic detours
- **PA-14:** Operate construction equipment and vehicles in the stream channel
- **PA-16:** Remove and disturb aquatic vegetation, stream sediment, and LWD
- **PA-17:** Install temporary cofferdams and diversion cofferdams
- **PA-18:** Temporarily redirect stream flow
- **PA-19:** Temporarily draft water from streams and other water bodies
- **PA-21:** Place concrete and concrete slurry seal coat in cofferdams, footing and bridge forms, culvert bedding, and other applications

- **PA-22:** Remove culverts
- **PA-23:** Clean, retrofit, or install culverts
- **PA-24:** Install fishways or stream gradient control structures
- **PA-28:** Capture, handle, exclude, salvage, and relocate listed species
- **PA-29:** Implement BMPs
- **PA-30:** Mitigation framework for potential adverse impacts on species listed under CESA

SSP-3.4: Replacement, Repair, and Retrofitting of Culverts to Maintain Culvert Function and, Where Practicable, Improve Flow Conditions to Support Fish Passage and Sediment Transport

Culverts can be damaged by storm events, debris, and cleaning activities. Damage that impairs function or that may result in erosion and damage to the roadway could require replacement, repair, or a retrofit. Culverts may also be replaced, repaired, or retrofitted to accommodate unforeseen flow, sediment, and debris conditions. Culvert replacements will include fish passage design criteria, where applicable, to maintain, improve, or provide fish passage and to ensure that Caltrans-managed infrastructure continues to function in a safe and efficient manner. Culvert repairs will include repairs to damaged culverts to maintain or improve fish passage through the culverts and to ensure infrastructure function. Culverts may also be retrofitted with baffles, weirs, fishways, and appurtenant grade control structures such as rock, wood, or concrete weirs to provide or improve fish passage.

Equipment/vehicles required to complete this SSP may include pickup trucks, cranes, backhoes, hauling trucks, vibratory pile-driving rigs, graders, trenchers, augers, pavement grinders, pavers, rollers, jack-hammers, and hand-held tools. The equipment operates from the road prism to the extent feasibly, although equipment will be required to operate outside of the developed road prism to replace, repair or retrofit culverts in some instances. Equipment/vehicle operation is not typically required in surface waters or sensitive habitats (e.g., wetlands), although at times operation within such habitats may be required to complete this SSP in a timely manner or to reduce impacts on riparian vegetation or other terrestrial an aquatic species, habitats, or resources.

The area affected by this SSP will vary depending upon the scale of the culvert replacement, repair or retrofit. However, the area affected is not expected to be greater than 100 linear feet of channel. The extent of the area affected will be dependent upon the PAs required to complete this SSP. PAs that will result in impacts on surface waters are PA-7, PA-14, PA-16 through PA-19, PA-21 through PA-24, and PA-28. Should all of these PAs be required, the affected area is not expected to exceed 100 linear feet of channel. It is difficult to determine the square footage of the affected area at the programmatic level due to the variety of channels that could be affected, which could range from 1 foot to 10 feet in width (e.g., area affected could range from 100 to 1,000 square feet).

Table 5-10 below provides the annual frequency for SSP-3.4 by Caltrans District, within the coverage area.

Table 5-10. Annual Frequency of SSP-3.4 per Caltrans District

Site-Specific Project		Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-3.4: Replacement, repair and retrofitting of culverts to maintain function and, where practicable, improve flow conditions to support fish passage and sediment transport	Total	150	80	60
	Fish Bearing Streams	30	30	30

PAs used in this SSP include the following:

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-7:** Treat and discharge water conveyed from the construction area
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-11:** Grade and establish temporary and permanent staging/storage areas for sediment, debris, and construction materials and equipment
- **PA-13:** Grade temporary access roads and traffic detours
- **PA-14:** Operate construction equipment and vehicles in the stream channel
- **PA-16:** Remove and disturb aquatic vegetation, stream sediment, and LWD
- **PA-17:** Install temporary cofferdams and diversion cofferdams
- **PA-18:** Temporarily redirect stream flow
- **PA-19:** Temporarily draft water from streams and other water bodies
- **PA-21:** Place concrete and concrete slurry seal coat in cofferdams, footing and bridge forms, culvert bedding, and other applications
- **PA-22:** Remove culverts
- **PA-23:** Clean, retrofit, or install culverts
- **PA-24:** Install fishways or stream gradient control structures

- **PA-28:** Capture, handle, exclude, salvage, and relocate listed species
- **PA-29:** Implement BMPs
- **PA-30:** Mitigation framework for potential adverse impacts on species listed under CESA

CA-4: Bridge Repair, Retrofit, Replacement, and Maintenance

Bridge repair, retrofit, replacement, and maintenance are implemented to prolong the use and function of bridges, ensure motorist safety, and protect the environment. Whether a bridge is repaired, rehabilitated, or replaced depends on the age of a bridge and damage that may occur to a bridge (e.g., from a storm event, earthquake, or vehicle or boat collision). The following SSPs are proposed for coverage as part of this CA. The lists following each SSP description identify those PAs that may be required to complete the SSP. The lists are comprehensive, but not every potential PA will be utilized in every SSP.

SSP-4.1 Repair of Bridges to Maintain Function

Bridge maintenance generally includes work such as repairing damage or deterioration in various bridge components; cleaning out drains; repairing expansion joints; cleaning and repairing structural steel; sealing concrete surfaces; and sanding and painting. Bridge maintenance includes work initiated by Caltrans districts and work recommended in bridge inspection reports. Work initiated by the district is generally in response to a problem on a bridge that would affect public safety or the integrity of the structure if not promptly addressed.

Equipment/vehicles required to complete this SSP may include pickup trucks, pavement removal equipment, vibratory pile-driving rigs, pavers, rollers, grinders, jackhammers, welding machines, augers, hauling trucks, and hand-held power tools. The equipment operates from the road prism, although in rare instances equipment may be required to operate outside of the developed road prism to repair bridge abutments or supports. Equipment/vehicle operation is not typically required in surface waters or sensitive habitats (e.g., wetlands), although at times operation within such habitats may be required to complete this SSP in a timely manner or to reduce impacts on riparian vegetation or other terrestrial or aquatic species, habitats, or resources.

The area affected by this SSP will vary depending upon the scale of the bridge repair. However, the length affected is not expected to be greater than 100 linear feet of channel. The extent of the area affected will be dependent upon the PAs required to complete this SSP. PAs that could potentially result in impacts on surface waters are PA-7, PA-14 through PA-19, PA-21, PA-23 through PA-26, and PA-28. Should all of these PAs be required, the affected area will not exceed 100 linear feet of channel. It is difficult to determine the square footage of the affected area at the programmatic level due to the variety of channels that could be affected, which could range from 10 to 50 feet in width (e.g., area affected could range from 1,000 to 5,000 square feet).

Table 5-11 below provides the annual frequency for SSP-4.1 by Caltrans District, within the coverage area.

Table 5-11. Annual Frequency of SSP-4.1 per Caltrans District

Site-Specific Project		Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-4.1: Repair of bridges to maintain function	Total	50	30	60
	Fish Bearing Streams	10	5	10

PAs used in this SSP include the following:

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-7:** Treat and discharge water conveyed from the construction area
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-11:** Grade and establish temporary and permanent staging/storage areas for sediment, debris, and construction materials and equipment
- **PA-13:** Grade temporary access roads and traffic detours
- **PA-14:** Operate construction equipment and vehicles in the stream channel
- **PA-15:** Construct temporary stream crossings
- **PA-16:** Remove and disturb aquatic vegetation, stream sediment, and LWD
- **PA-17:** Install temporary cofferdams and diversion cofferdams
- **PA-18:** Temporarily redirect stream flow
- **PA-19:** Temporarily draft water from streams and other water bodies
- **PA-20:** Install permanent and temporary rock slope protection (RSP), sheet piles, and retaining walls
- **PA-21:** Place concrete and concrete slurry seal coat in cofferdams, footing and bridge forms, culvert bedding, and other applications
- **PA-23:** Clean, retrofit, or install culverts
- **PA-24:** Install fishways or stream gradient control structures
- **PA-25:** Remove existing bridge structure, including footings, piers, and piles
- **PA-26:** Install bridge structures, excluding pile-driving

- **PA-28:** Capture, handle, exclude, salvage, and relocate listed species
- **PA-29:** Implement BMPs
- **PA-30:** Mitigation framework for potential adverse impacts on species listed under CESA

SSP-4.2: Rehabilitation of Small Bridges to Maintain Bridge Function and Meet Current Standards and Specifications (e.g., Earthquake Standards)

Aging, storm events, debris, cleaning activities, earthquakes, and collisions by vehicles and boats may damage small bridges. Damage to an extent that impairs safety and function could require rehabilitation. In addition, current standards and specifications may require that bridges be retrofitted. Rehabilitation could include reinforcement of the bridge structure and placement of additional piers and footings.

Equipment/vehicles required to complete this PA may include pickup trucks, backhoes, cranes, hauling trucks, trenchers, augers, vibratory pile-driving rigs, drilling rigs, pavers, rollers, grinders, jackhammers, earth tampers, and hand-held power tools. The equipment generally operates from the road prism, although in rare instances equipment may be required to operate outside of the developed road prism to rehabilitate small bridges. Equipment/vehicle operation is not typically required in surface waters or sensitive habitats (e.g., wetlands), although at times operation within such habitats may be required to complete this SSP in a timely manner or to reduce impacts on riparian vegetation or other terrestrial or aquatic species, habitats, or resources.

The area affected by this SSP will vary depending upon the scale of the bridge rehabilitation. However, the length of channel affected is not expected to be greater than 100 linear feet. The extent of the area affected will be dependent upon the PAs required to complete this SSP. PAs that could potentially result in impacts on surface waters are PA-7, PA-14 through PA-22, PA-24 through PA-26, and PA-28. Should all of these PAs be required, the affected area will not exceed 100 linear feet of channel. It is difficult to determine the square footage of the affected area at the programmatic level due to the variety of channels that could be affected, which could range from 10 to 50 feet in width (e.g., area affected could range from 1,000 to 5,000 square feet).

Table 5-12 below provides the annual frequency for SSP-4.2 by Caltrans District, within the coverage area.

Table 5-12. Annual Frequency of SSP-4.2 per Caltrans District

Site-Specific Project	Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-4.2: Rehabilitation of small bridges to maintain bridge function and meet current standards and specifications (e.g., earthquake standards)	10	5	10

PAs used in this SSP include the following:

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-7:** Treat and discharge water conveyed from the construction area
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-11:** Grade and establish temporary and permanent staging/storage areas for sediment, debris, and construction materials and equipment
- **PA-13:** Grade temporary access roads and traffic detours
- **PA-14:** Operate construction equipment and vehicles in the stream channel
- **PA-15:** Construct temporary stream crossings
- **PA-16:** Remove and disturb aquatic vegetation, stream sediment, and LWD
- **PA-17:** Install temporary cofferdams and diversion cofferdams
- **PA-18:** Temporarily redirect stream flow
- **PA-19:** Temporarily draft water from streams and other water bodies
- **PA-20:** Install permanent and temporary rock slope protection (RSP), sheet piles, and retaining walls
- **PA-21:** Place concrete and concrete slurry seal coat in cofferdams, footing and bridge forms, culvert bedding, and other applications
- **PA-22:** Remove culverts
- **PA-24:** Install fishways or stream gradient control structures
- **PA-25:** Remove existing bridge structure, including footings, piers, and piles
- **PA-26:** Install bridge structures, excluding pile-driving
- **PA-28:** Capture, handle, exclude, salvage, and relocate listed species
- **PA-29:** Implement BMPs
- **PA-30:** Mitigation framework for potential adverse impacts on species listed under CESA

SSP-4.3: Replacement of Small Bridges to Maintain Bridge Function, Meet Current Standards and Specifications, and, Where Practicable, Improve Flow Conditions for Fish Passage and Sediment Transport

Aging, storm events, debris, cleaning activities, earthquakes, and collisions by vehicles and boats may damage small bridges. Damage to an extent that impairs safety and function could require bridge replacement. In addition, current standards and specifications may require bridge removal and replacement. Bridges may also be replaced to accommodate unforeseen flow, sediment, and debris conditions. Where practicable, replacement bridges would improve flow conditions to support fish passage and sediment transport.

Additionally, this SSP will cover the replacement of culverts with small bridges. Culverts that must be replaced may be replaced with small bridges when financially and technically feasible. The primary purpose for inclusion of this SSP is to streamline and provide an incentive for replacement of small bridges and culverts with new bridges to improve fish passage and other stream dynamics.

Equipment/vehicles required to complete this PA may include pickup trucks, backhoes, cranes, hauling trucks, trenchers, augers, vibratory pile-driving rigs, drilling rigs, pavers, rollers, grinders, jackhammers, earth tampers, and hand-held power tools. The equipment generally operates from the road prism, although equipment may be required to operate outside of the developed road prism to replace small bridges. Equipment/vehicle operation is not typically required in surface waters or sensitive habitats (e.g., wetlands), although at times operation within such habitats may be unavoidable.

The area affected by this SSP will vary depending upon the scale of the bridge replacement. The length of channel potentially affected will generally be less than 100 linear feet on either side of stream. The extent of the area affected will be dependent upon the PAs required to complete this SSP. PAs that could potentially result in impacts on surface waters are PA-7, PA-14 through PA-26, and PA-28. Should all of these PAs be required, the affected area is not expected to exceed 100 linear feet of stream channel. It is difficult to determine the square footage of the affected area at the programmatic level due to the variety of channels that could be affected, which could range from 10 to 50 feet in width (e.g., area affected could range from 1,000 to 5,000 square feet).

Table 5-13 below provides the annual frequency for SSP-4.3 by Caltrans District, within the coverage area.

Table 5-13. Annual Frequency of SSP-4.3 per Caltrans District

Site-Specific Project	Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-4.3: Replacement of small bridges to maintain bridge function, meet current standards and specifications and, where practicable, improve flow conditions for fish passage and sediment transport	5	5	5

PAs used in this SSP include the following:

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-7:** Treat and discharge water conveyed from the construction area
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-11:** Grade and establish temporary and permanent staging/storage areas for sediment, debris, and construction materials and equipment
- **PA-13:** Grade temporary access roads, traffic detours, and staging and work areas
- **PA-14:** Operate construction equipment and vehicles in the stream channel
- **PA-15:** Construct temporary stream crossings
- **PA-16:** Remove and disturb aquatic vegetation, stream sediment, and LWD
- **PA-17:** Install temporary cofferdams and diversion cofferdams
- **PA-18:** Temporarily redirect stream flow
- **PA-19:** Temporarily draft water from streams and other water bodies
- **PA-20:** Install permanent and temporary rock slope protection (RSP), sheet piles, and retaining walls
- **PA-21:** Place concrete and concrete slurry seal coat in cofferdams, footing and bridge forms, culvert bedding, and other applications
- **PA-22:** Remove culverts
- **PA-23:** Clean, retrofit, or install culverts
- **PA-24:** Install fishways or stream gradient control structures
- **PA-25:** Remove existing bridge structure, including footings, piers, and piles
- **PA-26:** Install bridge structures, excluding pile-driving
- **PA-28:** Capture, handle, exclude, salvage, and relocate listed species
- **PA-29:** Implement BMPs
- **PA-30:** Mitigation framework for potential adverse impacts on species listed under CESA

CA-5: Maintenance Planning

The strength and longevity of bridges, culverts, and other infrastructure ultimately depends on their foundations. Maintenance planning typically involves geotechnical investigations to facilitate early planning for future activities related to culverts, bridges, and slope stabilization. The following SSPs are proposed for coverage as part of this CA. The lists following each SSP description identify those PAs that may be required to complete the SSP. The lists are comprehensive, but not every potential PA will be utilized in every SSP.

SSP-5.1: Drilling of Geotechnical Test Holes to Facilitate the Early Planning Process for Future Culvert Replacement, Bridge Rehabilitation and Replacement, and Side Slope Stabilization Projects

The strength and longevity of bridges, culverts, and other infrastructure ultimately depends on their foundations. Part of the design process associated with new structures or retrofitting is to conduct a foundation investigation. In these investigations, geotechnical test holes are drilled to collect subsurface information. This includes depth-to-parent material (rock), rock type and quality, soil type and strength, and groundwater levels. This information is then used to develop a soil/rock profile used to recommend a foundation and design for the project.

Equipment/vehicles required to complete this PA may include pickup trucks, backhoes, bulldozers, hauling trucks, augers, vibratory pile-driving rigs, drilling rigs, and hand-held power tools. The equipment operates from the road prism, although in rare instances equipment may be required to operate outside of the developed road prism to complete a geotechnical boring in an appropriate area for completion of adequate planning or engineering efforts. Equipment/vehicle operation rarely occurs in surface waters or sensitive habitats (e.g., wetlands), although operation within such habitats may unavoidable.

The area affected by this SSP will vary depending upon the scale of the culvert replacement, repair or retrofit. However, the length of channel affected is not expected to exceed 10 linear feet of channel. The extent of the area affected will be dependent upon the PAs required to complete this SSP. The PA that could potentially result in impacts on surface waters is PA-5. Should this PA be required, the affected area will not exceed 10 linear feet of channel. It is difficult to determine the square footage of the affected area at the programmatic level due to the variety of channels that could be affected, which could range from 1 foot to 50 feet in width (e.g., area affected could range from 10 to 500 square feet).

Table 5-14 below provides the annual frequency for SSP-5.1 by Caltrans District, within the coverage area.

Table 5-14. Annual Frequency of SSP-5.1 per Caltrans District

Site-Specific Project	Caltrans District 1	Caltrans District 2	Caltrans District 4
SSP-5.1: Drilling of geotechnical test holes to facilitate the early planning process for future culvert replacement, bridge rehabilitation and replacement, and side slope stabilization projects	120	80	220

PAs used in the SSP include the following:

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-8:** Use drill rigs and drilling lubricants
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-11:** Grade and establish temporary and permanent staging/storage areas for sediment, debris, and construction materials and equipment
- **PA-13:** Grade temporary access roads and traffic detours
- **PA-14:** Operate construction equipment and vehicles in the stream channel
- **PA-29:** Implement BMPs
- **PA-30:** Mitigation framework for potential adverse impacts on species listed under CESA

5.2 Project Actions and BMPs

Each SSP involves implementation by Caltrans of one or more PAs to repair and maintain transportation infrastructure. Listed below are all the proposed PAs that could be implemented to complete the SSPs, as described in Section 5.1. These PAs are the actions that are assessed in Chapter 6 for their potential to affect federally protected species, in relation to how they may be implemented to complete the SSPs.

- **PA-1:** Operate construction equipment and vehicles
- **PA-2:** Use temporary lighting for night construction activities
- **PA-3:** Maintain and fuel construction equipment and vehicles
- **PA-4:** Clean the roadway of sediment and debris from landslide, flood events, and construction
- **PA-5:** Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials
- **PA-6:** Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure
- **PA-7:** Treat and discharge water conveyed from the construction area
- **PA-8:** Use drill rigs and drilling lubricants

- **PA-9:** Paint, wash, seal, and caulk bridges, guardrails, and other infrastructure
- **PA-10:** Remove and disturb upland, riparian, and wetland vegetation
- **PA-11:** Grade and establish temporary and permanent staging/storage areas for sediment, debris, and construction materials and equipment
- **PA-12:** Construct temporary sediment-settling basins
- **PA-13:** Grade temporary access roads and traffic detours
- **PA-14:** Operate construction equipment and vehicles in the stream channel
- **PA-15:** Construct temporary stream crossings
- **PA-16:** Remove and disturb aquatic vegetation, stream sediment, and LWD
- **PA-17:** Install temporary cofferdams and diversion cofferdams
- **PA-18:** Temporarily redirect stream flow
- **PA-19:** Temporarily draft water from streams and other water bodies
- **PA-20:** Install permanent and temporary rock slope protection (RSP), sheet piles, and retaining walls
- **PA-21:** Place concrete and concrete slurry seal coat in cofferdams, footing and bridge forms, culvert bedding, and other applications
- **PA-22:** Remove culverts
- **PA-23:** Clean, retrofit, or install culverts
- **PA-24:** Install fishways or stream gradient control structures
- **PA-25:** Remove existing bridge structure, including footings, piers, and piles
- **PA-26:** Install bridge structures, excluding impact pile-driving
- **PA-27:** Blast rock and other substrate
- **PA-28:** Capture, handle, exclude, salvage, and relocate listed species
- **PA-29:** Implement BMPs
- **PA-30:** Mitigation framework for potential adverse impacts on species listed under CESA

The number and type of PAs required for each SSP will be determined by the resident engineer during project design. Table 5-1 provides a summary of the potential PAs that might be associated with each SSP. As part of the reporting process presented in this PBA, Caltrans will be required to clearly identify which PAs they will implement/or have implemented to complete each SSP.

For each PA, BMPs will be implemented to avoid or minimize impacts on fish and wildlife species covered under this PBA and their associated habitats. These BMPs are listed and described briefly in tables following the descriptions of each PA below, and they are described in

detail in Appendix C. These BMPs include standard BMPs that have been approved by Caltrans in its *Statewide Stormwater Management Plan* (SWMP) under the National Pollutant Discharge Elimination System (NPDES) permit (California Department of Transportation 1999).

Additional BMPs (ABMPs) (not included in the SWMP) that were developed specifically to avoid or minimize project effects that may not be covered by the standard BMPs are also listed below. The ABMPs were developed following a review of mitigation measures and the terms and conditions in existing consultation documents, including letters of no effect, streambed alteration agreements, BAs, and BOs. These ABMPs generally encompass the range of avoidance and minimization requirements identified in existing BOs for similar actions in California, Oregon, and Washington. The ABMPs provide a laundry list of measures that project engineers and biologists can choose from when implementing a PA. Not all ABMPs may be feasible or achievable when implementing a specific PA.

PA-1: Operate Construction Equipment and Vehicles

This PA includes the transport of personnel, equipment, and materials to and from the project site and operation of specific equipment on the project site. Construction-related equipment and vehicles may include:

- trucks, pickups, water trucks, cement and pavement trucks, hauling trucks, and other vehicles;
- tractors, graders, and other land-moving machinery;
- backhoes, trenchers, augers, vibratory pile-driving rigs, drilling rigs, forklifts, and cranes;
- pavement layers, rollers, and other machinery for removing and laying concrete and asphalt; and
- chainsaws, other saws, grinders, drills, jackhammers, earth tampers, welding machines, and other tools and equipment.

Operation of equipment and vehicles is required to complete all of the SSPs, which could affect environmental conditions, covered species, or their habitat. Movement of construction equipment and personnel temporarily increases physical disturbance, noise, and vibration along the road right-of-way and at work sites. Disturbance, noise, and vibration are factors that may alter habitat and the behavior of animals.

Typically, the operation of construction equipment or vehicles is required to implement each SSP. The operation may be as simple as a pickup truck driving from a Caltrans maintenance shop to a culvert to clean debris from the inlet or as complex as dump-trucks, backhoes, and paving equipment to replace a culvert. Equipment will typically operate from the road prism or the upland portions of the right-of-way, but when operation below the OHWL is required, such actions are covered under PA-14. Table 5-15 below provides the anticipated frequency PA-1 will be required each year within the Caltrans Districts covered.

Table 5-15. Annual Frequency of PA-1 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-1: Operate construction equipment and vehicles	9,000	1,000	10,000

There are no applicable standard BMPs for PA-1, but the following ABMPs have been developed to avoid or minimize project effects on covered species and their habitats:

- **ABMP-1.1:** Equipment will be operated during the least sensitive diurnal, seasonal, and meteorological periods relative to the potential effects on listed species and habitat if feasible

- **ABMP-1.2:** Equipment will not operate in sensitive areas or habitats, such as wetlands and surface waters

- **ABMP-1.3:** Equipment will be inspected on a daily basis for leaks and completely cleaned of any external petroleum products, hydraulic fluid, coolants, and other deleterious materials prior to operating equipment.

- **ABMP-1.4:** A Spill Prevention, Control, and Countermeasures (SPCC) Plan will be developed for each project that requires the operation of construction equipment and vehicles. The SPCC Plan will be kept on-site during construction and the appropriate materials and equipment will also be on-site during construction to ensure the SPCC Plan can be implemented. Personnel will be knowledgeable in the use and deployment of the materials and equipment so response to an accidental spill will be timely.

PA-2: Use Temporary Lighting for Night Construction Activities

For some projects, night work may be necessary to expedite completion during specific construction windows (e.g., the dry season) and to minimize dis**r**uption of traffic flow, especially in urban areas. Night work may require use of bright lights to facilitate construction activities that could potentially alter the behavior of animals in affected adjacent habitats.

Temporary lighting is anticipated to be required in the coverage area each year to complete some SSPs. Temporary lighting will be placed within the Caltrans road prism and will be used to illuminate construction activities when work is required 24 hours per day, such as when a construction window limits the time available to complete a project. Table 5-16 below provides the anticipated frequency PA-2 will be required each year within the Caltrans Districts covered.

Table 5-16. Annual Frequency of PA-2 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-2: Use temporary lighting for night construction activities	2,400	250	2,500

There are no applicable standard BMPs for PA-2, but three ABMPs have been developed to avoid or minimize project effects on covered species and their habitats:

- **ABMP-2.1:** Maintenance and construction activities will be avoided at night
- **ABMP-2.2:** When night work cannot be avoided, disturbance of listed species will be avoided and minimized by restricting substantial use of temporary lighting to the least sensitive seasonal and meteorological windows
- **ABMP-2.3:** Lights on work areas will be shielded and focused to minimize lighting of listed-species habitat

PA-3: Maintain and Fuel Construction Equipment and Vehicles

Accidental spills of petroleum products can occur during refueling, maintenance, and operation of construction-related equipment and vehicles. The potential for spills is higher for larger SSPs that require on-site refueling and maintenance. Accidental spills can result from operator error, leaking hoses and other fuel and lubricant transfer devices, equipment breakdown (e.g., seal failure), improper washing of construction machinery, puncture and failure of fuel and lubricant storage containers, and other factors. Fuel and lubricants may contaminate soil or nearby water bodies.

In general, maintenance and fueling of construction equipment and vehicles is performed prior to implementing an SSP. Many SSPs can be completed with no on-site maintenance or fueling activities required. Other SSPs are more intensive and do require fueling, and sometimes maintenance of equipment and vehicles. However, equipment and vehicle maintenance requiring replacement of fluids, seals, filters or potential exposure to hazardous materials will be performed off-site at an approved facility. The BMPs and ABMPs are intended to avoid impacts from fueling or maintenance of construction equipment and vehicles. Table 5-17 below provides the anticipated frequency PA-3 will be required each year within the Caltrans Districts covered.

Table 5-17. Annual Frequency of PA-3 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-3: Maintain and fuel construction equipment and vehicles	9,000	1,000	10,000

Note – this activity generally occurs at commercial facilities and maintenance stations.

Table 5-18 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-3. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-18. Approved Best Management Practices for PA-3

BMP Category	Maintenance BMPs[a]	Construction Site BMPs[a]
Vehicle and equipment cleaning	C.15.1	NS-8
Vehicle and equipment fueling	C.15.2	NS-9
Vehicle and equipment maintenance	C.15.3	NS-10
Spill prevention and control	C.13.1	WM-4
Hazardous waste management	C.13.3	WM-6
Contaminated soil management	C.13.4	WM-7
Safer alternative products	C.21	N/A
Liquid waste management	C.13.6	WM-10

[a] Appendix C provides detailed descriptions of each BMP.

Four ABMPs may be incorporated as part of PA-3:

- **ABMP-1.2:** Equipment will not operate in sensitive areas or habitats, such as wetlands and surface waters.
- **ABMP-1.3:** Equipment will be inspected on a daily basis for leaks and completely cleaned of any external petroleum products, hydraulic fluid, coolants, and other deleterious materials prior to operating equipment.
- **ABMP-1.4:** A SPCC Plan will be developed for each project that requires the operation of construction equipment and vehicles. The SPCC Plan will be kept on-site during construction and the appropriate materials and equipment will also be on-site during construction to ensure the SPCC Plan can be implemented. Personnel will be knowledgeable in the use and deployment of the materials and equipment so response to an accidental spill will be timely.
- **ABMP-3.1:** Maintenance and fueling of construction equipment and vehicles will occur at least 15 meters from the OHWL of surface water or the edge of sensitive habitats (e.g., wetlands).

PA-4: Clean the Roadway of Sediment and Debris from Landslide, Flood Events, and Construction

Substantial sediment and debris may be deposited on the roadway by side slope failure and high streamflow. Sediment and debris are excavated from the roadway and shoulders in the manner directed by the resident engineer. In addition, sediment and debris tracked onto the roadway by movement of construction-related equipment and vehicles is also removed from roadways and shoulders. All sediment and debris is removed from the roadway by scraping, sweeping, and/or washing according to standard BMPs.

In general, this PA requires the use of a front-end loader, backhoe, dump truck, and street sweeper. The construction equipment will generally operate from the road prism, although equipment operation beyond the road prism within the maintained right-of-way may be required on occasion, depending upon the sediment and debris to be removed. Table 5-19 below provides the anticipated frequency PA-4 will be required each year within the Caltrans Districts covered.

Table 5-19. Annual Frequency of PA-4 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-4: Clean the Roadway of Sediment and Debris During and Following Maintenance and Construction Activities	9,000	1,000	10,000

Note – this work occurs on an as-needed basis; the anticipated frequency provided above is the worst case. Many activities do not result in enough sediment to warrant sweeping.

Table 5-20 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-4. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-20. Approved Best Management Practices for PA-4

BMP Category	Maintenance BMPs[a]	Construction Site BMPs[a]
Stabilized activity entrance and exit	C.12.1	TC-1
Tire inspection and sediment removal	C.12.2	TC-2
Spill prevention and control	C.13.1	WM-4
Liquid waste management	C.13.6	WM-10
Water conservation practices	C.18	NS-1
Sweeping and vacuuming	C.29	SC-7

[a] Appendix C provides detailed descriptions of each BMP.

One ABMP has been developed for PA-4:

- **ABMP-5.1:** Sediment and debris removed from the roadway will be disposed of off-site, at an approved location, where it cannot enter surface waters.

PA-5: Temporarily and Permanently Store Sediment, Debris, Pavement, Petroleum Products, Concrete, and Other Construction Materials

Sediment, debris, pavement, petroleum products, concrete, gravel, sand, and other construction-related materials may be stored on or off the construction site during various SSPs. Rainfall events, spillage, and other factors can result in unintended dispersion of sediment and debris and construction-related materials into adjacent surface waters or sensitive habitats (e.g., wetlands).

In general, for the SSPs covered under this PBA, the size required to temporarily and permanently store construction materials is relatively small, averaging 50 square feet. The implementation of this PA will include certain BMPs and ABMPs to avoid and minimize impacts. Table 5-21 below provides the anticipated frequency of PA-5 each year within the Caltrans Districts covered.

Table 5-21. Annual Frequency of PA-5 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-5: Temporarily and Permanently Store Sediment, Debris, Pavement, Petroleum Products, Concrete, and Other Construction Materials	9,000	1,000	10,000

Note – these numbers are the worst case. Many activities will not require temporary or permanent storage of materials.

Table 5-22 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-5. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-22. Approved Best Management Practices for PA-5

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Material delivery and storage	C.14.1	WM-1
Stockpile management	C.17	WM-3
Contaminated soil management	C.13.4	WM-7
Concrete waste management	C.13.7	WM-8
Material use	C.14.2	WM-2
Solid waste management	C.13.2	WM-5
Liquid waste management	C.13.6	WM-10
Hazardous waste management	C.13.3	WM-6
Sweeping and vacuuming	C.29	SC-7

[a] Appendix C provides detailed descriptions of each BMP.

Two ABMPs are applicable for PA-5:

- **ABMP-1.4**: A SPCC Plan will be developed for each project that requires the operation of construction equipment and vehicles. The SPCC Plan will be kept on-site during construction and the appropriate materials and equipment will also be on-site during construction to ensure the SPCC Plan can be implemented. Personnel will be knowledgeable in the use and deployment of the materials and equipment so response to an accidental spill will be timely.
- **ABMP-5.1**: Storage areas for sediment, debris, pavement, petroleum products, concrete and other construction materials will be located a minimum of 15 meters from the OHWL of surface waters and the boundary of sensitive habitat (e.g., wetlands).

PA-6: Apply Pavement, Petroleum Products, Concrete, and Other Construction Materials to the Surface of Roads, Bridges, and Related Infrastructure

Repair and maintenance activities include the application of pavement and concrete to road surfaces and bridge decks. Resurfacing roadways may also include grooving and other treatments. Repair and replacement of the roadway following culvert installation may require 1,000 square feet of pavement or concrete, although smaller culvert installations may require less. Repair and replacement of pavement and concrete roadway on bridges may require up to

8,000 square feet. Road repair projects vary considerably in magnitude, but single projects may entail up to 2 miles of pavement or concrete replacement.

Pavement, petroleum products, concrete, gravel, sand, and other construction-related materials may be transported to the construction site. For larger projects, on-site or site-related storage areas may be developed (PA-5). Rainfall events, spillage, and other factors during and following application may result in unintended dispersion of construction-related materials into adjacent species habitat.

PA-6 does not include the creation of new impervious surface area, only the repair or replacement of existing impervious surface area.

This PA occurs within the existing managed roadway prism, and does not include any activities outside of the right-of-way. Table 5-23 below provides the anticipated frequency of PA-6 each year within the Caltrans Districts covered.

Table 5-23. Annual Frequency of PA-6 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-6: Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure	300	100	300

Table 5-24 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-6. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-24. Approved Best Management Practices for PA-6

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Concrete waste management	C.13.7	WM-8
Material delivery and storage	C.14.1	WM-1
Material use	C.14.2	WM-2
Paving operations procedures	C.16	NS-3
Solid waste management	C.14.2	WM-5
Liquid waste management	C.13.6	WM-10
Hazardous waste management	C.13.3	WM-6

[a] Appendix C provides detailed descriptions of each BMP.

Two ABMPs are applicable for PA-6:

- **ABMP**-1.4: A SPCC Plan will be developed for each project that requires the operation of construction equipment and vehicles. The SPCC Plan will be kept on-site during construction and the appropriate materials and equipment will also be on-site during construction to

ensure the SPCC Plan can be implemented. Personnel will be knowledgeable in the use and deployment of the materials and equipment so response to an accidental spill will be timely.

- **ABMP-6.1:** Falsework will be installed to keep bridge debris and construction, maintenance, and repair materials from falling into streams during demolition, construction, and substantial maintenance and repair activities

PA-7: Treat and Discharge Water Conveyed from the Construction Area

Water conveyed from construction sites, including projects to remove sediment and debris from roadways, may contain sediment and construction-related material. Water is commonly pumped to desiccate cofferdams and to remove water that seeps into excavated holes around footings and other structures. Water may also be pumped from geotechnical drilling sites and conveyed to sediment-settling basins for treatment.

Transfer of fine sediment and other contaminants to streams and other adjacent water bodies can negatively affect covered species and their habitats. Potential negative impacts will be avoided or minimized. Use of sediment-settling areas, basins, baker tank**,** and other sediment removal methods may be necessary to avoid or minimize potential impacts. The use of the settling areas and basins will depend on the volume of water conveyed, type and volume of associated sediment, and factors affecting percolation of water and settling of the material.

Implementation of this PA requires the use of sump pumps and appropriate erosion control measures to filter out fine sediments and avoid erosion of upland areas. This PA may affect up to 1,500 square feet of upland area as water is discharged to upland areas and allowed to either infiltrate back into the ground (depending upon porosity) or flow through a series of weed-free hay bales and sediment fencing to remove suspended sediments prior to discharge back to a surface water. Table 5-25 below provides the anticipated frequency of PA-7 each year within the Caltrans Districts covered.

Table 5-25. Annual Frequency of PA-7 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-7: Treat and discharge water conveyed from the construction area	4,500	500	5,000

Table 5-26 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-7. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-26. Approved Best Management Practices for PA-7

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Dewatering operations	C.28	NS-2

[a] Appendix C provides detailed descriptions of each BMP.

Two ABMPs have been developed for PA-7:

- **ABMP-7.1:** Water pumped from areas isolated from surface water to allow construction to occur in the dry will be discharged to an upland area providing overland flow and infiltration before returning to stream. Upland areas may include sediment basins of sufficient size to allow infiltration rather than overflow or adjacent dry gravel/sand bars if the water is clean and no visible plume of sediment is created downstream of the discharge. Other measures may be used such as a baker tank or methods described in BMP NS-2 listed in Table 5-6.

- **ABMP-**7.2: A professional fish biologist will be on site to observe de-watering activities and to capture/rescue any fish that are observed in an isolated area during de-watering activities.

PA-8: Use Drill Rigs and Drilling Lubricants

Drilling may be used during projects that involve stabilizing side slopes, installing and replacing bridges, and drilling geotechnical test holes to gather pre-project information for future installation and replacement of bridges, culverts, and other infrastructure.

Geotechnical drilling consists of drilling holes to varying depths using circular drill bits. Casings are driven to a depth that allows sealing. Inner casings are inserted together with drilling mud (bentonite clay or polymer) to a greater depth to obtain more samples. After drilling is completed and the inner casing and core samples are removed, the outer casings are flushed out until the water runs clear. Then, the outer casings are removed. Geotechnical test holes are generally 4 to 6 inches in diameter.

This PA may be implemented a maximum of 950 times per year within the coverage area. According to the BA for the Van Duzen Bridge Replacement on U.S. Highway 101, total anticipated drilling for one test bore may require 1 to 2 weeks, depending on the depth of drilling and drilling substrate.

Drilling into side slopes may be conducted to install drainage for slope stabilization. Up to approximately 187 projects per year may involve drilling into side slopes.

Lubricants are necessary where drilling encounters rock. Lubricants may be spilled accidentally during drilling operations or afterward (e.g., during removal of casings), and could adversely affect listed species and habitat.

This PA will occur in upland areas, active stream channels (i.e., ephemeral streams and gravel bars of perennial streams). It is not anticipated that drilling will require work in an active, wetted channel below the OHWL. In general, the area affected by geotechnical drilling is approximately 25 square feet. Generally less area is affected during implementation of this PA. Table 5-27 below provides the anticipated frequency of PA-8 each year within the Caltrans Districts covered.

Table 5-27. Annual Frequency of PA-8 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-8: Use drill rigs and drilling lubricants	350	150	450

Table 5-28 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-8. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-28. Approved Best Management Practices for PA-8

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Liquid waste management	C.13.6	WM-10
Material use	C.14.2	WM-2
Material and equipment use over water	N/A	NS-13

[a] Appendix C provides detailed descriptions of each BMP.

Five ABMPs are applicable for PA-8:

- **ABMP-1.4:** A SPCC Plan will be developed for each project that requires the operation of construction equipment and vehicles. The SPCC Plan will be kept on-site during construction and the appropriate materials and equipment will also be on-site during construction to ensure the SPCC Plan can be implemented. Personnel will be knowledgeable in the use and deployment of the materials and equipment so response to an accidental spill will be timely.
- **ABMP-8.1:** Drilling will be conducted outside of the stream channel or only in dry stream beds
- **ABMP-8.2:** When geotechnical drilling takes place within the stream channel, including gravel beds and bars, drilling mud will be bentonite without additives; initial drilling through gravel will be accomplished using clean water as a lubricant; after contact with bedrock or consolidated material, drilling mud (i.e., bentonite clay) may be used
- **ABMP-8.3:** All drilling fluids and materials will be self-contained and removed from the site after use; drilling will be conducted inside a casing so that all spoils are recoverable in a collection structure
- **ABMP-8.4:** If drilling must occur in water, the work area will be isolated or the flow will be diverted around the work area

PA-9: Paint, Wash, Seal, and Caulk Bridges, Guardrails, and Other Infrastructure

Bridge repair and maintenance activities include washing, sandblasting, painting, patching, bonding, and filling voids in concrete with epoxy. Epoxy may be pumped into cracks in concrete to re-bond separated pieces, pumped into voids in concrete such as rock pockets or spaces between steel expansion dams and the concrete deck, and used as a bonding agent between original concrete and new concrete or mortar. Toluene, methylethylketone, or lacquer thinner may be used to clean tools. Similar washing, sandblasting, painting, and patching may be

implemented for maintenance of guardrails and other infrastructure. In addition, this action may include minor replacement and repair of bridge structural elements, such as individual trusses, stringers, and girders.

Generally, the implementation of this PA requires the use of light equipment, primarily hand-held power tools. However, replacement or repair of bridge structure elements, such as individual trusses, stringers, and girders, may require the use of heavy equipment. It is relatively rare that an individual truss, stringer, or girder would require replacement or repair, and generally this PA will entail maintenance activities such as painting, washing, and sealing existing infrastructure using hand-held power tools and other light equipment. Table 5-29 below provides the anticipated frequency of PA-9 each year within the Caltrans Districts covered.

Table 5-29. Annual Frequency of PA-9 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-9: Paint, wash, seal, and caulk bridges, guardrails, and other infrastructure	60	30	80

Table 5-30 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-9. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-30. Approved Best Management Practices for PA-9

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Material use	C.14.2	WM-2
Solid waste management	C.13.2	WM-5
Liquid waste management	C.13.6	WM-10
Hazardous waste management	C.13.3	WM-6
Sweeping and vacuuming	C.29	SC-7
Material and equipment use over water	N/A	NS-13

[a] Appendix C provides detailed descriptions of each BMP.

Two ABMPs are applicable to PA-9:

- **ABMP-1.4:** A SPCC Plan will be developed for each project that requires the operation of construction equipment and vehicles. The SPCC Plan will be kept on-site during construction and the appropriate materials and equipment will also be on-site during construction to ensure the SPCC Plan can be implemented. Personnel will be knowledgeable in the use and deployment of the materials and equipment so response to an accidental spill will be timely.

- **ABMP-6.1:** Falsework will be installed to keep bridge debris and construction, maintenance, and repair materials from falling into streams during demolition, construction, and substantial maintenance and repair activities

PA-10: Remove and Disturb Upland, Riparian, and Wetland Vegetation

Upland, riparian, and wetland vegetation may be removed or disturbed during implementation of many SSPs. Vegetation may be removed by cutting, mowing, bulldozing, or burning with the use of such equipment as a backhoe, front-end loader, torch, and/or chainsaw. In general, the extent of vegetation removal is likely to be small. During drilling of geotechnical test holes, vegetation may be cleared from up to 480 square feet, potentially removing vegetation along 10 to 12 feet of stream channel or wetland. Most vegetation removed is herbaceous, but woody vegetation measuring 10 to 150 feet tall or 2 to 36 inches in diameter at breast height (dbh) is also removed periodically although most vegetation removed in riparian areas is less than 6 inches dbh. Removal of vegetation during culvert and bridge replacement may affect 5,000 to 15,000 square feet of riparian vegetation, although most culvert and bridge replacement projects affect less than 5,000 square feet of vegetation. Removal of vegetation along the streambank ranges from 5 to 80 linear feet for the largest projects. Few trees greater than 3 to 5 inches dbh have historically been removed at any project site, although trees from 24 to 36 inches dbh have been removed where removal is unavoidable to facilitate culvert and bridge installation or where substantial area may be cleared for side slope stabilization.

Implementation of this PA may require the removal of anywhere from 480 to 15,000 square feet of vegetation, depending upon the SSP. Table 5-31 below provides the anticipated frequency of PA-10 each year within the Caltrans Districts covered.

Table 5-31. Annual Frequency of PA-10 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-10: Remove and disturb upland, riparian, and wetland vegetation	900	500	900
Above OHWL (upland)	*650*	*350*	*700*
Below OHWL (riparian/wetland)	*250*	*150*	*200*

Note – these numbers are worst case. It is estimated that approximately 95% of projected actions do not involve removal of vegetation. Another 1 to 3% remove only very small areas of vegetation (approximately 100 square feet). Culvert replacements, bridge repairs and construction and access roads are the primary reasons for vegetation removal.

Table 5-32 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-10. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-32. Approved Best Management Practices for PA-10

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Preservation of existing vegetation	C.8	SS-2
Vegetated slope inspection	C.26	N/A
Hydraulic mulch	C.7.3	SS-3
Hydroseeding and handseeding	C.7.4	SS-4
Soil binders	C.7.5	SS-5
Straw mulch	C.7.6	SS-6
Geotextiles, mats and plastic covers, and erosion control blankets	C.7.7	SS-7
Wood mulching	C.7.2	SS-8

[a] Appendix C provides detailed descriptions of each BMP.

Nine ABMPs are applicable to PA-10:

- **ABMP-1.4:** A SPCC Plan will be developed for each project that requires the operation of construction equipment and vehicles. The SPCC Plan will be kept on-site during construction and the appropriate materials and equipment will also be on-site during construction to ensure the SPCC Plan can be implemented. Personnel will be knowledgeable in the use and deployment of the materials and equipment so response to an accidental spill will be timely.
- **ABMP-10.1:** Trees as identified in any special contract provisions or as directed by the Project Engineer will be preserved
- **ABMP-10.2:** Hazard trees greater than 24-inches diameter DBH will be removed only by direction of the Project Engineer
- **ABMP-10.3:** Trees will be felled in such a manner as not to injure standing trees and other plants
- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats
- **ABMP-10.5:** Vegetation will be mowed to a height greater than 4 inches.
- **ABMP-10.6:** Soil compaction will be minimized by using equipment that can reach over sensitive areas and that minimizes the pressure exerted on the ground
- **ABMP-10.7:** Where soil compaction is unintended, compacted soils will be loosened after heavy construction activities are complete
- **ABMP-10.8:** Where vegetation removal is temporary to support construction activities, native species will be re-established that are specific to the project location and that comprise a diverse community of woody and herbaceous plants

PA-11: Grade and Establish Temporary and Permanent Staging/Storage Areas for Sediment, Debris, and Construction Materials and Equipment

Caltrans maintenance and repair projects often generate excess pavement or soil excavation materials or require materials/equipment that must be stored either on- or off-site. The size, location, and extent of land needed for these uses vary greatly, ranging from an existing narrow strip within the state right-of-way to larger blocks of land nearby or at a distance from the construction site, depending on site availability and nature of the use. Front-end loaders, bulldozers, road graders, and other equipment may grade storage areas.

This action addresses primarily the disturbance, exposure, and covering of soil. Disturbance and exposure of soil by grading activities can cause erosion. Permanent storage areas also permanently alter the local landform. Storage areas vary substantially by project. Temporary storage areas are generally small, usually less than 5,000 square feet. The sediment storage area for culvert removal and installation may require up to 5,000 square feet. Larger areas approaching 10,000 square feet may be necessary for bridge removal and installation and for debris on roadways associated with side slope failure. Permanent storage areas for sediment and debris are also generally less than 5,000 square feet, although suitable sites may be as large as 2.5 acres.

In general, staging/storage areas are located in currently developed areas to avoid impacts on undisturbed areas. However, it is necessary at times to create staging/storage areas. Several SSPs may require the creation of such areas, and depending upon the SSP the area required for such an area will vary and will be driven by site-specific conditions. The majority of these areas will be temporary; however, some SSPs may require a permanent staging/storage area, including replacement of culverts and replacement of bridges, which may require that a permanent area be created to park vehicles for future inspections or maintenance activities. Areas created for permanent staging/storage are generally small, requiring perhaps 500 square feet on average. Table 5-33 below provides the anticipated frequency of PA-11 each year within the Caltrans Districts covered. Although the numbers reflected below are relatively large, they include the large percentage of time when paved, graveled, or otherwise disturbed/developed areas with ruderal vegetation are used to store materials or stage equipment. It is relatively rare that these areas are disturbed in a manner that will require erosion control BMPs.

Table 5-33. Annual Frequency of PA-11 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-11: Grade and establish temporary and permanent storage areas for sediment, debris, and construction materials	4,500	500	5,000

Note – most locations will not involve grading; rather, they will involve the use of paved or unpaved roadway shoulders or other flat disturbed portions of the roadway prism with ruderal vegetation.

Table 5-34 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-11. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-34. Approved Best Management Practices for PA-11

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Scheduling and planning	C.3	SS-1
Vegetated slope inspection	C.26	N/A
Hydroseeding and handseeding	C.7.4	SS-4
Geotextiles, mats and plastic covers, and erosion control blankets	C.7.7	SS-7
Fiber rolls	C.4.4	SC-5
Compaction	C.7.1	N/A
Sandbag or gravel bag barrier	C.4.2	SC-6
Straw bale barrier	C.4.3	SC-9
Check dam	C.4.5	SC-4
Sediment trap	C.4.6	SC-3
Riprap (rock slope protection)	C.7.8	N/A
Outlet protection/velocity dissipation devices	N/A	SS-10
Sweeping and vacuuming	C.29	SC-7
Solid waste management	C.13.2	WM-5
Concrete waste management	C.13.7	WM-8

[a] Appendix C provides detailed descriptions of each BMP.

Eight ABMPs are applicable for PA-11:

- **ABMP-1.4:** A SPCC Plan will be developed for each project that requires the operation of construction equipment and vehicles. The SPCC Plan will be kept on-site during construction and the appropriate materials and equipment will also be on-site during construction to ensure the SPCC Plan can be implemented. Personnel will be knowledgeable in the use and deployment of the materials and equipment so response to an accidental spill will be timely.
- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats
- **ABMP-10.7:** Where soil compaction is unintended, compacted soils will be loosened after heavy construction activities are complete
- **ABMP-10.8:** Where vegetation removal is temporary to support construction activities, native species will be re-established that are specific to the project location and that comprise a diverse community of woody and herbaceous plants
- **ABMP-11.1:** Storage areas will disturb less than 2.5 acres of vegetated or currently undisturbed area
- **ABMP-11.2:** Storage areas will not disturb wetlands or other special status plant communities
- **ABMP-11.3:** For permanent storage areas that have been filled to capacity with sediment and debris, the final configuration will conform to natural contours (elevations, profile, and gradient) of surrounding terrain and native plant species will be established that are specific to the project location and comprise a diverse community of woody and herbaceous plants
- **ABMP-**11.4: Construction staging and storage areas will be located a minimum of 15 meters from surface waters and other sensitive habitat (e.g., wetlands)

PA-12: Construct Temporary Sediment-Settling Basins

Sediment-settling basins include de-silting basins and sediment traps. Both are temporary basins that detain sediment-laden runoff and allow sediment to settle out before discharging. A de-silting basin is formed by excavation or construction of an embankment and contains a controlled-release structure that enables sediment to settle. A sediment trap is formed by excavation or construction of an earthen embankment across a swale or low drainage area. In some cases native material is pushed up in a berm on flat ground to allow sediment-laden material to decant. Sediment-settling basins are effective for the removal of trash, gravel, sand, and silt.

Grading and constructing sediment-settling basins may be necessary for many SSPs covered by the PBA, depending on the need to treat water from construction sites. Construction may be accomplished by front-end loaders, bulldozers, road graders, and other equipment. Inlets to the sediment-settling basin will be located to maximize the travel distance to the outlet. Rock and vegetation may be used to protect the basin outlets against erosion. Removal of sediment from the temporary basins is required when the storage volume is reduced by one-third. If safety is a concern, temporary basins must be fenced. Safety fencing, embankments, inlet and outfall

structures, and other features must be maintained. Sediment from settling basins will be hauled to approved storage sites or disposal facilities.

The area of sediment-settling basins varies substantially by project. Some geotechnical drilling projects may require small sediment-settling basins, usually covering less than 50 square feet. Culvert replacement projects may require larger sediment-settling basins exceeding 300 square feet. The area of basins for bridge removal and installation may approach 1,000 square feet.

Table 5-35 below provides the anticipated frequency of PA-12 each year within the Caltrans Districts covered.

Table 5-35. Annual Frequency of PA-12 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-12: Construct temporary sediment-settling basins	200	100	100

Note – The numbers above reflect what might occur in one year if no basins existed within the existing right of way. However, many settling basins are reused from year to year so while they are used in a given year a significantly reduced number might be installed in new locations.

Table 5-36 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-12. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-36. Approved Best Management Practices for PA-12

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Scheduling and planning	C.3	SS-1
Vegetated slope inspection	C.26	
Hydroseeding and handseeding	C.7.4	SS-4
Geotextiles, mats and plastic covers, and erosion control blankets	C.7.7	SS-7
Fiber rolls	C.4.4	SC-5
Compaction	C.7.1	N/A
Sandbag, gravel bag barrier, and gravel bag berm	C.4.2	SC-6
Straw bale barrier	C.4.3	SC-9
Check dam	C.4.5	SC-4
Sediment trap	C.4.6	SC-3
Riprap (RSP)	C.7.8	N/A
Outlet protection and velocity dissipation devices	N/A	SS-10
Sweeping and vacuuming	C.29	SC-7
Dewatering operations	C.28	NS-2

[a] Appendix C provides detailed descriptions of each BMP.

Four ABMPs have been developed for PA-12:

- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats

- **ABMP-10.7:** Where soil compaction is unintended, compacted soils will be loosened after heavy construction activities are complete
- **ABMP-10.8:** Where vegetation removal is temporary to support construction activities, native species will be re-established that are specific to the project location and that comprise a diverse community of woody and herbaceous plants
- **ABMP-12.1:** Temporary sediment basins will be cleaned of sediment and the site restored to pre-construction contours (elevations, profile, and gradient) and function post-construction

PA-13: Grade Temporary Access Roads and Traffic Detours

Grading, constructing, and clearing of temporary access roads and traffic detours may be necessary for some SSPs covered by the PBA, depending on accessibility of the project site and the area required to perform the work. In general, temporary access roads are more commonly used than temporary traffic detours. The size, location, and extent of land needed for these temporary features vary to some degree, ranging from 200 square feet to 30,000 square feet, depending on the SSP and the access or detour required. Grading may be accomplished by front-end loaders, bulldozers, road graders, and other equipment.

This PA results primarily in the removal, disturbance, and exposure of soil, and it may range from substantial to minimal grade cutting and filling. The area of disturbance varies substantially by SSP. For geotechnical drilling projects, grading temporary access may disturb and expose 200 square feet. Culvert replacement may result in grading and other soil disturbance activities of up to 10,000 square feet. Bridge replacement potentially requires grading and other soil disturbance activities that may total more than 30,000 square feet, including upland areas required for access roads and detours.

Whether temporary access roads or traffic detours are required to complete an SSP will be determined by the Project Engineer; it is difficult to estimate how frequently this PA may be implemented on an annual basis. In general, a temporary access road may be required to access a component of a project that requires safe and efficient heavy equipment access. In general, the area affected will vary from 200 to 30,000 square feet. Temporary traffic detours that involve grading or clearing are rarely required; however, they are necessary from time to time. Temporary traffic detours may affect an area approximately 500 to 30,000 square feet to accommodate passenger vehicles safely through or around a construction area. Table 5-37 below provides the anticipated frequency of PA-13 each year within the Caltrans Districts covered.

Table 5-37. Annual Frequency of PA-13 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-13: Grade temporary access roads and traffic detours	4,500	500	5,000

Note – The above numbers are worst case and assume a need to build access roads or detours on most actions. The expected numbers are estimated at less than 2% of the numbers shown for actual grading of the traveled way, shoulder, and adjacent upper roadway prism.

Table 5-38 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-13. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-38. Approved Best Management Practices for PA-13

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Scheduling and planning	C.3	SS-1
Vegetated slope inspection	C.26	N/A
Hydroseeding and handseeding	C.7.4	SS-4
Geotextiles, mats and plastic covers, and erosion control blankets	C.7.7	SS-7
Fiber rolls	C.4.4	SC-5
Compaction	C.7.1	N/A
Sandbag, gravel bag barrier, and gravel bag berm	C.4.2	SC-6
Straw bale barrier	C.4.3	SC-9
Check dam	C.4.5	SC-4
Sediment trap	C.4.6	SC-3
Riprap (RSP)	C.7.8	N/A
Outlet protection and velocity dissipation devices	N/A	SS-10
Sweeping and vacuuming	C.29	SC-7

[a] Appendix C provides detailed descriptions of each BMP.

Four ABMPs are applicable for PA-13:

- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats
- **ABMP-10.7:** Where soil compaction is unintended, compacted soils will be loosened after heavy construction activities are complete
- **ABMP-10.8:** Where vegetation removal is temporary to support construction activities, native species will be re-established that are specific to the project location and that comprise a diverse community of woody and herbaceous plants
- **ABMP-13.1:** Temporary access and detours will be located a minimum of 15 meters from surface waters and other sensitive habitats (i.e. wetlands)

PA-14: Operate Construction Equipment and Vehicles in the Stream Channel

For certain SSPs, the operation of construction equipment and vehicles in the stream channel cannot be avoided. The action includes primarily work required to install culverts, bridges, and bank and channel stabilization structures. In-channel construction-related equipment and vehicles may include trucks, tractors, backhoes, trenchers, augers, vibratory pile-driving rigs, drilling rigs, jackhammers, earth tampers, and other equipment.

Movement of construction equipment and personnel in the stream channel temporarily increases physical disturbance, noise, and vibration. Implementation of BMPs and ABMPs can reduce the discharge of sediment and other pollutants and minimize the impact on watercourses and species.

The primary concern is disturbance of the stream channel substrate and associated species habitat. Disturbance, noise, and vibration are factors that may alter the behavior of animals in adjacent and affected habitat. Equipment operating within the stream channel could affect individual animals.

Instances that require the operation of construction equipment within the stream channel do occur due to access to a particular site or feature or safety of construction crews or roadway users. The operation may be as benign as a bucket-arm operating below the OHWL to clean debris from a culvert inlet or as complex as a piece of heavy equipment crossing an active channel, or even operating from an active channel in order to replace a culvert or repair a bridge. PA-14 should only be employed if PA-15 would result in greater impacts or is infeasible. The area affected by equipment operation within a stream channel is kept to the minimum area necessary to complete the work safely and efficiently, and will generally vary depending upon the size of the stream channel and the SSP being implemented. In general however, the area affected will vary from 100 square feet for a culvert replacement project on a relatively small stream up to 2,000 square feet for a similar project on a moderate size stream. Table 5-39 below provides the anticipated frequency of PA-14 each year within the Caltrans Districts covered.

Table 5-39. Annual Frequency of PA-14 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-14: Operate construction equipment and vehicles in the stream channel	4,500	500	5,000

Note – the above numbers represent a worst case scenario if every SSP that may employ this PA required operation of equipment and vehicles in channels. It is expected that such activities would happen less than 2% of the time.

Table 5-40 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-14. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-40. Approved Best Management Practices for PA-14

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Material and equipment use over water	N/A	NS-13
Temporary stream crossing	N/A	NS-4
Streambank stabilization	N/A	SS-12

[a] Appendix C provides detailed descriptions of each BMP.

Nine ABMPs have been developed for PA-14:

- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats
- **ABMP-14.1:** Work will be conducted only in dry stream beds or within cofferdams

- **ABMP-14.2:** Existing roadways and stream crossings will be used for temporary access roads whenever reasonable and safe
- **ABMP-14.3:** The number of access and egress points and total area affected by vehicle operation will be minimized; disturbed areas will be located to reduce damage to existing native aquatic vegetation, substantial large woody debris, and spawning gravel
- **ABMP-14.4:** Culverts and bridge abutments and piers will be cleaned, and RSP and other bank protection will be placed by working from the top of the bank or bridge
- **ABMP-14.5:** If any life stage of any listed species may be present during in-water activities or substantial disturbance, then capture, handling, exclusion, salvage, and relocation will be considered for the listed species
- **ABMP-14.6:** Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, all in-water activities will be conducted outside the spawning and incubation season for listed fish species, where such species occur, or to periods identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions
- **ABMP-14.7:** Modified or disturbed portions of streams, banks, and riparian areas will be restored as nearly as possible to natural and stable contours (elevations, profile, and gradient)
- **ABMP-14.8:** Operation of construction equipment and vehicles in-water will occur in non-anadromous waters only

PA-15: Construct Temporary Stream Crossings

A temporary stream crossing is a structure placed across a waterway that allows vehicles to cross the waterway during construction without entering the water, eliminating erosion and downstream sedimentation caused by the vehicles. Prior to installing any temporary stream crossing within the active, wetted channel, the channel shall be dewatered (PA-17 and/or PA-19) and fish removal and exclusion shall be implemented (PA-28). Temporary stream crossings are typically installed at sites where construction equipment or vehicles need to frequently cross a waterway and alternate access routes impose significant constraints. Caltrans equipment and materials are moved along temporary access roads to the temporary stream crossings. Temporary stream crossings are generally installed on streams with flowing water, on waterways that may sustain significant erosion from vehicle movement, and where construction activities will not last longer than 1 year. For geotechnical drilling projects, temporary channel crossings may be required at up to six projects a year. Temporary crossings generally affect an area less than 500 square feet, although some SSPs may affect up to 1,000 square feet, depending upon the size of the stream channel that must be crossed and the equipment that must use the temporary crossing. Materials that are typically used when constructing temporary stream crossings include cobbles, gravel, sandbags, culverts, and temporary bridging structures (e.g., flatcar bridges).

Temporary stream crossings are typically required for less than one to two months, Occasionally, a temporary crossing will be in place for three or more months depending upon the SSP. Temporary stream crossings are typically installed using a backhoe or bull dozer to grade the access to the stream crossing then installing the temporary fill material and stream conveyance measure into the channel within the isolated area from which fish have been excluded, per PA-28. Once construction activities are completed, the material used to construct

the temporary stream crossing is removed from the channel using a backhoe and the stream channel is returned to its pre-project condition, to the degree possible. Typically the material used to construct the temporary stream crossing is similar in size, shape, and composition to the material naturally occurring within the stream channel to minimize impacts from decommissioning the temporary stream crossing. Table 5-41 below provides the anticipated frequency of PA-15 each year within the Caltrans Districts covered.

Table 5-41. Annual Frequency of PA-15 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-15: Construct temporary stream crossings	125	50	50

Note – The above numbers represent a worst case scenario. It is expected that the PA would occur less than one percent of the time projected in the worst case.

Table 5-42 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-15. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-42. Approved Best Management Practices for PA-15

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Temporary stream crossing	N/A	NS-4

[a] Appendix C provides detailed descriptions of each BMP.

A total of 10 ABMPs have been developed for PA-15:

- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats
- **ABMP-10.8:** Where vegetation removal is temporary to support construction activities, native species will be re-established that are specific to the project location and that comprise a diverse community of woody and herbaceous plants
- **ABMP-14.1:** Work will be conducted only in dry stream beds or within cofferdams
- **ABMP-14.2:** Existing roadways and stream crossings will be used for temporary access roads whenever reasonable and safe
- **ABMP-14.3:** The number of access and egress points and total area affected by vehicle operation will be minimized; disturbed areas will be located to reduce damage to existing native aquatic vegetation, substantial large woody debris, and spawning gravel
- **ABMP-14.5:** If any life stage of any listed species may be present during in-water activities or substantial disturbance, then capture, handling, exclusion, salvage, and relocation will be considered for the listed species
- **ABMP-14.6:** Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, all in-water activities will be conducted outside the spawning and

incubation season for listed fish species, where such species occur, or to periods identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions

- **ABMP-14.7:** Modified or disturbed portions of streams, banks, and riparian areas will be restored as nearly as possible to natural and stable contours (elevations, profile, and gradient)
- **ABMP-15.1:** Stream width, depth, velocity, and slope that provide upstream and downstream passage of adult and juvenile fish will be preserved according to current NMFS and DFG guidelines and criteria or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions
- **ABMP-15.2:** Temporary fills, cofferdams, and diversion cofferdams that are left in stream channels will be composed of non-erosive materials (e.g., washed, rounded, spawning-sized gravel between 0.4 to 4 inches in diameter); gravel in contact with flowing water will be left in place and allowed to disperse naturally by high winter flows; materials placed above the ordinary high water mark must be clean washed rock or contained to prevent material conveyance to the stream or mixing with clean gravel

PA-16: Remove and Disturb Aquatic Vegetation, Stream Sediment, and Large Woody Debris

Aquatic vegetation, sediment, and LWD may be removed or disturbed by SSPs involving cleaning of debris; installation of bank stabilization structures, culverts, bridges, and stream gradient control structures; and operation of equipment within the stream channel. Aquatic vegetation is any emergent and submerged vascular plant (e.g., cattails or tulles) occurring in perennial water bodies (e.g., streams, rivers, and lakes).

Excavators (e.g., backhoes) with extended arms and, when applicable bulldozers and/or front-end loaders may be used to clean and remove aquatic vegetation, sediment, and LWD from a stream channel. Cleaning and removal activities may take place in drainage channels, ditches, and stream channel segments adjacent to roads, culverts, bridges, and other infrastructure. Removal of aquatic vegetation, sediment, and LWD may also be necessary in stream channel areas where resulting hydraulics threaten to erode roads and other infrastructure.

Geotechnical drilling projects may disturb approximately 50 square feet of sediment within a stream channel, including placement of gravel to support drill rigs. Removal of sediment and debris takes place at as many as 375 culverts and bridges annually in the PBA coverage area**.** The volume of sediment and woody debris removed is generally small (less than 1 cubic yard), and removal generally affects only a few linear feet of stream channel. Ninety percent of the time, removal of debris involves raking or shoveling leaves and sticks out of a culvert inlet. This activity minimizes the potential for blockages that could capture increasingly large material and possibly result in flooding, roadway prism damage and, in rare cases, culvert and roadway failure. However, up to 500 linear feet of stream channel may be disturbed for some SSPs, and as much as 50 cubic yards of sediment may be removed. In rare instances, up to 0.5 acre of stream channel may be affected, although for most projects the affected area is less than a few hundred square feet. Culvert cleaning at most locations takes place every 1 to 5 years, depending on winter storm events and stream debris and sediment load. Cleaning culverts usually requires a few hours, but may take several days for larger culverts with considerable debris and sediment buildup.

Sediment and debris are also removed from drainage channels and ditches. Sediment may be removed from up to 200 linear feet of drainage ditch at a single location. Sediment removal generally requires 1 to 2 days and may be required every 1 to 5 years, depending on winter storm events.

Sediment removal is most appropriate in summer, when streams and drainage channels and ditches may be dry or flow is low, although removal of debris and sediment may be warranted to prevent loss and damage to infrastructure during wet seasons and storm events.

Table 5-43 below provides the anticipated frequency of PA-16 each year within the Caltrans Districts covered.

Table 5-43. Annual Frequency of PA-16 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-16: Remove and disturb aquatic vegetation, stream sediment, and large woody debris	150	125	100

Note – at least 95% of the numbers above involve removal by hand of leaves and small amounts of debris and/or sediment.

Table 5-44 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-16. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-44. Approved Best Management Practices for PA-16

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Liquid waste management	C.13.6	WM-10
Material use	C.14.2	WM-2

[a] Appendix C provides detailed descriptions of each BMP.

A total of 15 ABMPs have been developed for PA-16:

- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats
- **ABMP-14.1:** Work will be conducted only in dry stream beds or within cofferdams
- **ABMP-14.5:** If any life stage of any listed species may be present during in-water activities or substantial disturbance, then capture, handling, exclusion, salvage, and relocation will be considered for the listed species
- **ABMP-14.6**: Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, all in-water activities will be conducted outside the spawning and incubation season for listed fish species, where such species occur, or to periods identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions

- **ABMP-14.7:** Modified or disturbed portions of streams, banks, and riparian areas will be restored as nearly as possible to natural and stable contours (elevations, profile, and gradient)
- **ABMP-15.2:** Temporary fills, cofferdams, and diversion cofferdams that are left in stream channels will be composed of non-erosive materials (e.g., washed, rounded, spawning-sized gravel between 0.4 to 4 inches in diameter); gravel in contact with flowing water will be left in place and allowed to disperse naturally by high winter flows; materials placed above the ordinary high water mark must be clean washed rock or contained to prevent material conveyance to the stream or mixing with clean gravel
- **ABMP-16.1:** Disturbance and removal of aquatic vegetation will be minimized
- **ABMP-16.2:** The limits of disturbance will be identified; native vegetation, stream channel substrate, and large woody debris disturbed outside these limits should be replaced if damaged
- **ABMP-16.3:** The minimum amount of wood, sediment and gravel, and other natural debris necessary to maintain and protect culvert and bridge function, ensure suitable fish passage conditions, and minimize disturbance of the streambed, will be removed using hand tools where feasible
- **ABMP-16.4:** LWD subject to damage or removal will be retained and replaced on site after project completion as long as such action would not jeopardize infrastructure or private property or create a liability for Caltrans. LWD not replaced on-site may be stored or offered to other entities for use in other mitigation/restoration projects where feasible
- **ABMP-16.5:** Disturbed areas will be minimized by locating temporary work areas to avoid patches of native aquatic vegetation, substantial LWD, and spawning gravel
- **ABMP-16.6:** Where vegetation removal is temporary to support construction activities, native species will be re-established that are specific to the project location and that comprise a diverse community of aquatic plants
- **ABMP-16.7:** Where spawning gravel is removed temporarily to facilitate construction, it will be stored adjacent to the site then placed back in the channel post-construction at approximately pre-project depth and gradient.
- **ABMP-16.8:** Excavated material that will not be placed in the channel or on the bank will not be stored or stockpiled in the channel and will be end-hauled to an approved disposal site
- **ABMP-16.9:** Gravel and LWD excavated from the channel that is temporarily stockpiled for reuse in the channel will be stored in a manner that prevents mixing with stream flows

PA-17: Install Temporary Cofferdams and Diversion Cofferdams

Cofferdams temporarily isolate in-channel activities from the streamflow. Enclosed areas are pumped dry to temporarily expose the bottom of a stream, lake, estuary, or other water body. Cofferdams facilitate the maintenance, repair, and replacement of bridge piers, culverts, RSP, and other infrastructure elements. Cofferdams may affect limited areas of the stream or entire stream segments (see PA-18). Where an entire stream segment is isolated, cofferdams may be constructed upstream of the work area at the inlet and downstream of the work area at the outlet. Diversion cofferdams are built to allow diversion of water from a stream for water drafting

purposes. Cofferdams may be constructed of sheet piles, gravel, sandbags, inflatable dams, or other non-erosive materials. Following repair, maintenance, and installation activities, cofferdams are removed. Cofferdam removal generally entails removing the downstream portions of the cofferdam first and allowing the work area to re-water, then slowly allowing flow to re-enter the work area and allow any subsequent re-suspension of sediments or sediment plume to be minimal. Up to 130 cofferdams may be installed annually. The area affected by the installation of a temporary cofferdam varies depending upon the size of the stream and the work being performed. In general, cofferdams affect from 100 square feet to 2,000 square feet. Table 5-45 below provides the anticipated frequency of PA-17 each year within the Caltrans Districts covered.

Table 5-45. Annual Frequency of PA-17 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-17: Install temporary cofferdams and diversion cofferdams	45	35	50

Note – the above numbers represent a worst case scenario. The installation of temporary cofferdams and diversions is expected to occur in only a very small percentage (1%) of projects involving this PA.

There are no applicable standard BMPs for PA-17. However, nine ABMPs have been developed for PA-17:

- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats
- **ABMP-14.5:** If any life stage of any listed species may be present during in-water activities or substantial disturbance, then capture, handling, exclusion, salvage, and relocation will be considered for the listed species
- **ABMP-14.6:** Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, all in-water activities will be conducted outside the spawning and incubation season for listed fish species, where such species occur, or to periods identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions
- **ABMP-14.7:** Modified or disturbed portions of streams, banks, and riparian areas will be restored as nearly as possible to natural and stable contours (elevations, profile, and gradient)
- **ABMP-15.1:** Stream width, depth, velocity, and slope that provide upstream and downstream passage of adult and juvenile fish will be preserved according to current NMFS and DFG guidelines and criteria or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions
- **ABMP-15.2:** Temporary fills, cofferdams, and diversion cofferdams that are left in stream channels will be composed of non-erosive materials (e.g., washed, rounded, spawning-sized gravel between 0.4 and 4 inches in diameter); gravel in contact with flowing water will be left in place and allowed to disperse naturally by high winter flows; materials placed above the ordinary high water mark must be clean washed rock or contained to prevent material conveyance to the stream or mixing with clean gravel

- **ABMP-17.1:** Cofferdams and diversion cofferdams will affect no more of the stream channel than is necessary to support completion of the maintenance or construction activity
- **ABMP-17.2:** Immediately upon completion of in-channel work, temporary fills, cofferdams, diversion cofferdams, and other in-channel structures will be removed in a manner that minimizes disturbance to downstream flows and water quality
- **ABMP-17.3:** All structures and imported materials placed in the stream channel or on the banks during construction that are not designed to withstand high flows will be removed before such flows occur

PA-18: Temporarily Redirect Streamflow

Some maintenance and repair activities, including installation of culverts, bridges, and bank stabilization structures, may require temporary work in a dry stream channel. In conjunction with cofferdams constructed as described above (see PA-17), streamflow may be diverted temporarily by construction of diversion cofferdams and flow diversion conveyance structures. Diversion conveyance structures may include gravity flow through culverts and other pipes or, where necessary, pumping water through culverts or other pipes. Alternatively, flow may be directed into excavated alternative channels, including use of existing secondary stream channels. In addition, water may need to be pumped from within cofferdams that isolate construction areas for placement of RSP, construction of bridge footings, and installation of culverts.

At any one site, streamflow may be redirected from up to 300 linear feet of stream channel; however, most projects affect less than 50 linear feet of stream channel. For culvert replacement, up to 100 feet of stream channel may be desiccated, although most of the affected channel is inside the existing culvert.

In general the temporary redirection of streamflow will be required for projects that include significant work to stream crossing structures such as culverts and bridges. Water will be diverted from the upstream end of the isolated work area and discharged into the channel at the downstream end. Measures to avoid channel and bank erosion will be implemented, as will measures to avoid and minimize potential impacts on fish and fish habitat. Table 5-46 below provides the anticipated frequency of PA-18 each year within the Caltrans Districts covered.

Table 5-46. Annual Frequency of PA-18 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-18: Temporarily redirect streamflow	45	30	50

Note – the numbers above represent a worst case scenario. The diversion of streamflow is expected to occur in only a very small percentage (less than 1%) of the SSPs involving this PA.

Table 5-47 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-18. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-47. Approved Best Management Practices for PA-18

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Earth dikes and drainage flow conveyance controls	N/A	SS-9
Outlet protection and velocity dissipation devices	N/A	SS-10
Slope (overside) drains	C.6.1	SS-11
Clear water diversion	C.9	NS-5

[a] Appendix C provides detailed descriptions of each BMP.

A total of 12 ABMPs have been developed for PA-33:

- **ABMP-7.2:** A professional fish biologist will be on site to observe de-watering activities and to capture/rescue any fish that are observed in an isolated area during de-watering activities.
- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats
- **ABMP-14.5:** If any life stage of any listed species may be present during in-water activities or substantial disturbance, then capture, handling, exclusion, salvage, and relocation will be considered for the listed species
- **ABMP-14.6:** Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, all in-water activities will be conducted outside the spawning and incubation season for listed fish species, where such species occur, or to periods identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions
- **ABMP-14.7:** Modified or disturbed portions of streams, banks, and riparian areas will be restored as nearly as possible to natural and stable contours (elevations, profile, and gradient)
- **ABMP-15.1:** Stream width, depth, velocity, and slope that provide upstream and downstream passage of adult and juvenile fish will be preserved according to current NMFS and DFG guidelines and criteria or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions
- **ABMP-18.1:** The extent of stream channel desiccation will be limited to the minimum necessary to support construction activities. Monitoring of the stream diversion will occur periodically each day such devices are in operation to ensure proper function.
- **ABMP-18.2:** Construction of a temporary channel will proceed from the downstream to the upstream end of the channel.
- **ABMP-18.3:** Flow will not be diverted from the stream channel until the temporary channel is complete and all applicable soil stabilization/control measures are in place.
- **ABMP-18.4:** Flow will be diverted the minimum distance necessary to isolate the construction area.
- **ABMP-18.5:** Water will be released or pumped downstream at an appropriate rate to maintain downstream flows at all times and the outlet of all diversions shall be positioned

such that the discharge of water does not result in bank erosion or channel scour and maintains pre-project hydraulic conditions.

- **ABMP-18.6:** For diversion from streams, rivers, and other water bodies, any water intake structure will be installed, operated, and maintained in accordance with current NMFS, USFWS, and DFG criteria or as developed in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions.

PA-19: Temporarily Draft Water from Streams and Other Water Bodies

Drafting is the act of drawing or removing water from streams or other water bodies for use in maintenance and repair activities. Water drafting may be necessary for any SSPs requiring the use of water, including roadway cleaning, dust control, and fire control. Water drafting may also be necessary for irrigation of mitigation plantings. In general, the proportion of flow diverted is small in relation to the flow of the water body from which water is being drafted.

Typically water is drafted using a tank truck, which inserts a pipe fitted with an appropriate sized screen into the water body to draft water. The screen will be sized in accordance with current NMFS and DFG guidelines to avoid entrainment of juvenile fish as well as scouring of substrate material. This activity is localized and does not affect a significant area. Table 5-48 below provides the anticipated frequency of PA-19 each year within the Caltrans Districts covered.

Table 5-48. Annual Frequency of PA-19 per Caltrans District

Project Action		Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-19: Temporarily draft water from streams and other water bodies	Total	25	25	25
	Fish Bearing Stream	5	5	5

Note – The numbers above represent a worst case scenario. The expected number of times this PA is expected to occur for this PA would be a number less than 1% of the above number.

There are no standard BMPs for PA-19. However, two ABMPs have been developed for PA-19:

- **ABMP-14.5:** If any life stage of any listed species may be present during in-water activities or substantial disturbance, then capture, handling, exclusion, salvage, and relocation will be considered for the listed species
- **ABMP-18.6:** For diversion from streams, rivers, and other water bodies, any water intake structure will be installed, operated, and maintained in accordance with current NMFS, USFWS, and DFG criteria or as developed in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions.

PA-20: Install Permanent and Temporary Rock Slope Protection (RSP), Sheet Piles, and Retaining Walls

This PA encompasses a range of activities that have similar objectives and similar environmental effects. RSP, sheet piles, and retaining walls may be installed independently or in combination to stabilize side slopes and streambanks. Installation may take place in unstable upland areas, affecting upland and wetland vegetation, and along streambanks, affecting riparian, wetland, and

aquatic habitat and environmental conditions within stream channels. Installation of RSP, sheet piles, and retaining walls takes into consideration the habitat affected and any springs or watercourses or other features that might affect the stability of the design. Work within streams takes into consideration additional factors, including high water elevations, direction of flow and angle of impingement at various flow stages, and type of adjacent soils capable of resisting erosion from wash and eddy currents.

RSP consists of placing revetment-type rock courses on and above streambanks and on side slopes. RSP fabric is placed before laying RSP. The grading and placement of the individual pieces of rock will be consistent with Caltrans' Standard Specifications (2006a) and Standard Special Provisions (2006b). Rocks form a stable protection structure. Rounded boulders or cobbles are not used on prepared ground surfaces having slopes steeper than 1:2 (ratio of vertical to horizontal). Angular shapes may be used on any planned slope.

In streams, RSP could also be installed below the OHWL within the stream channel, especially to stabilize the channel bottom at the discharge of culverts.

For culvert installation, new RSP or other erosion control structures may cover up to 200 square feet of stream channel, affecting as much as 30 linear feet of the channel and up to 300 square feet of riparian vegetation. Culvert replacement may also require up to 600 square feet of replacement RSP, affecting up to 50 linear feet of stream channel and up to 400 square feet of riparian vegetation. Up to 100 linear feet of RSP (up to 200 to 300 square feet), sheet piles, and retaining walls may be installed at a project site along streambanks. Bridge installation may require 1,000 to 2,000 square feet of new RSP or other stabilization structures within the stream channel, affecting as much as 100 linear feet of stream channel and up to 1,000 square feet of riparian vegetation. Bridge installation may also require RSP replacement within 1,000 square feet of stream channel, affecting as much as 30 linear feet of the channel and up to 2,000 square feet of riparian vegetation. Most projects, however, will require substantially less RSP. RSP and other stabilization structures might also be installed on streambanks and side slopes along road shoulders. Up to 100 linear feet of new RSP may be installed to protect the roadway along a stream, affecting 300 square feet of riparian vegetation and stream channel. Also, RSP may be replaced along as much as 150 feet of stream channel to protect the roadway, affecting up to 1,500 square feet of riparian vegetation and stream channel.

The installation of RSP generally requires a dump truck for delivery of the material, and a backhoe, dozer, and/or a front end load for the placement of the material. Table 5-49 below provides the anticipated frequency of PA-20 each year within the Caltrans Districts covered.

Table 5-49. Annual Frequency of PA-20 per Caltrans District

Project Action		Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-20: Install permanent and temporarily rock slope protection (RSP), sheet piles, and retaining walls	Total	100	50	100
	Fish Bearing Stream	10	5	10

There are no standard BMPs for PA-20. However, 14 ABMPs have been developed for PA-20:

- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats
- **ABMP-14.1:** Work will be conducted only in dry stream beds or within cofferdams.
- **ABMP-14.5:** If any life stage of any listed species may be present during in-water activities or substantial disturbance, then capture, handling, exclusion, salvage, and relocation will be considered for the listed species
- **ABMP-14.6:** Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, all in-water activities will be conducted outside the spawning and incubation season for listed fish species, where such species occur, or to periods identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions
- **ABMP-14.7:** Modified or disturbed portions of streams, banks, and riparian areas will be restored as nearly as possible to natural and stable contours (elevations, profile, and gradient)
- **ABMP-15.1:** Stream width, depth, velocity, and slope that provide upstream and downstream passage of adult and juvenile fish will be preserved according to current NMFS and DFG guidelines and criteria or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions
- **ABMP-20.1:** Extension of existing areas of stream bank RSP or other bank protection (e.g., sheet piles) will be avoided and the extent of bank and channel armoring will be limited to the minimum necessary to protect essential infrastructure
- **ABMP-20.2:** Threatened infrastructure will be relocated to maintain or reestablish natural stream sediment processes
- **ABMP-20.3:** Bank stabilization will incorporate bioengineering solutions consistent with site-specific engineering requirements
- **ABMP-20.4:** Where RSP is necessary, native riparian vegetation and/or LWD in RSP will be incorporated
- **ABMP-20.5:** The embankment toe will not extend farther into the active channel than the existing embankment
- **ABMP-20.6:** RSP, sheet piles, and other erosion control materials will be pre-washed to remove sediment and/or contaminants
- **ABMP-20.7:** Temporary material storage piles (e.g., RSP) will not be placed in the 100-year floodplain during the rainy season, unless no rain is forecast and material is used within 12 hours of deposition

PA-21: Place Concrete and Concrete Slurry Seal Coat in Cofferdams, Footing and Bridge Forms, Culvert Bedding, and Other Applications

Concrete slurry is used to seal cofferdams installed to isolate culverts, bridge footings, and bank and channel stabilization sites from streamflow during construction. Concrete is placed in forms

to construct culvert bedding, culvert headwalls, bridge footings, bridge piers, pile caps, stream gradient control structures, and other infrastructure requiring concrete footings. Portland cement used in soil cement bedding and in construction of other infrastructure will conform to applicable provisions in the Standard Specifications for the use. Water used for concrete will be free from oil, salts and other impurities, which would have an adverse effect on the quality of concrete.

The placement of concrete and concrete slurry typically requires a concrete truck or a small electric cement mixer, depending upon the size of the project. Table 5-50 below provides the anticipated frequency of PA-21 each year within the Caltrans Districts covered.

Table 5-50. Annual Frequency of PA-21 per Caltrans District

Project Action		Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-21: Place concrete and concrete slurry seal coat in cofferdams, footings and bridge forms, culvert bedding, and other applications	Total	10	5	10
	Fish Bearing Stream	2	1	2

Table 5-51 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-21. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-51. Approved Best Management Practices for PA-21

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Concrete waste management	C.13.7	WM-8
Material use	C.14.2	WM-2
Solid waste management	C.13.2	WM-5
Liquid waste management	C.13.6	WM-10

[a] Appendix C provides detailed descriptions of each BMP.

Two ABMPs are applicable for PA-21:

- **ABMP-**1.4: A SPCC Plan will be developed for each project that requires the operation of construction equipment and vehicles. The SPCC Plan will be kept on-site during construction and the appropriate materials and equipment will also be on-site during construction to ensure the SPCC Plan can be implemented. Personnel will be knowledgeable in the use and deployment of the materials and equipment so response to an accidental spill will be timely.

- **ABMP-21.1:** When concrete is poured to construct bridge footings or other infrastructure in the vicinity of flowing water, work must be conducted to prevent contact of wet concrete with water (e.g., within a cofferdam). Concrete or concrete slurry will not come into direct contact with flowing water.

PA-22: Remove Culverts

Existing culverts must generally be removed before installing replacement culverts. Where culverts are removed from flowing streams, flow upstream of the culvert is captured and diverted around the work site. Water may be conveyed into existing roadside ditches to adjacent culverts, through temporary culverts or pipes in shallow trenches across the roadway, or by other methods (PA-18). In general, traffic is routed to one lane, and half of the culvert is removed at a time. The asphalt or concrete road surface is saw-cut, overlaying material is excavated, and half of the culvert is removed. The second half is removed following replacement of the old culvert (see PA-23). Backhoes and other excavators may be used, as well as dump trucks. Caltrans removes approximately 350 culverts each year, including up to 25 from perennial streams supporting anadromous fish species. Approximately another 50 culverts are removed in the dry from ephemeral streams that potentially support anadromous salmonids. Culverts removed range from 18 inches to 12 feet in diameter and may exceed 70 feet in length.

Removed culverts and road materials are transported off site and disposed of at an appropriate facility. Diversions of flow is required when removing a culvert in the wet, however the majority of culverts removed within the coverage area each year are removed in the dry (approximately 60%). The anticipated annual frequency of PA-22 within the covered Caltrans Districts covered is provided in Table 5-52.

Table 5-52. Annual Frequency of PA-22 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-22: Remove Culverts	135	85	130
Non-Fish Bearing – in-the-dry	*60*	*30*	*60*
Non-Fish Bearing – in-water	*45*	*30*	*45*
Fish Bearing – in-the-dry	*20*	*15*	*20*
Fish Bearing – in-water	*10*	*10*	*5*

Table 5-53 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-22. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-53. Approved Best Management Practices for PA-22

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Material use	C.14.2	WM-2
Solid waste management	C.13.2	WM-5
Structure demolition and removal over or adjacent to waters	N/A	NS-15
Concrete waste management	C.13.7	WM-8

[a] Appendix C provides detailed descriptions of each BMP.

Five ABMPs have been developed for PA-22:

- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats

- **ABMP-14.1:** Work will be conducted only in dry stream beds or within cofferdams.
- **ABMP-14.5:** If any life stage of any listed species may be present during in-water activities or substantial disturbance, then capture, handling, exclusion, salvage, and relocation will be considered for the listed species
- **ABMP-14.6:** Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, all in-water activities will be conducted outside the spawning and incubation season for listed fish species, where such species occur, or to periods identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions
- **ABMP-15.1:** Stream width, depth, velocity, and slope that provide upstream and downstream passage of adult and juvenile fish will be preserved according to current NMFS and DFG guidelines and criteria or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions

PA-23: Clean, Retrofit, or Install Culverts

Cleaning, retrofitting and installation of culverts primarily occurs on non-fish bearing channels, such as storm drains. Culverts are typically replaced with similarly sized culverts, using half-width trenching construction methodology. Most culverts are installed by excavation and backfilling, although pipe jacking is used where culverts are more than 16 feet below the roadbed. Jacking new culverts requires a larger work area for access and staging, possibly as much as 22,000 square feet (0.5 acre). Replacement strategies may also include placing high-density polyethylene (HDPE) plastic pipe liners into existing culverts and grouting to fill spaces. In addition, the invert of existing culverts may be paved with quick-drying grout to extend culvert life. Grout would be pumped from a mix truck on the roadway.

Native soils or concrete slurry may be used to backfill. Earth plugs are used to contain slurry mixtures. The backfill is normally paved after the new culvert is in place. The trench bed is shaped to fit the bottom of the culvert and provides uniform support throughout the entire length of the culvert. The trench may be excavated below the bottom of the culvert, in which case the shaped bedding would be constructed by backfilling and compacting culvert backfill material to the required line, grade, and shape. The bedding is shaped through the use of a template that conforms to the outside shape of the culvert. Headers set parallel to the grade of the culvert, established by the engineer, guide the use of the template (Standard Specifications).

Installation may also include construction of headwalls and endwalls. Replacement or addition of downdrains, flared end sections, rock energy dissipaters, and RSP may be necessary to improve the hydraulic performance of the culverts while minimizing erosion. Flared end sections, rock energy dissipaters, and RSP are placed on the outlets of culverts to prevent scour and reduce the velocity and energy of storm flows. Flared end sections reduce the velocity and energy of water outflow by increasing the width of the channel from which the water exits the culvert. Rock energy dissipaters and RSP are used to stabilize the channel at and below the outlet, often in conjunction with the placement of a flared end section. Flared end sections are placed on top of RSP underlain by fabric or gravel to further stabilize the outflow channel. In some cases, rock energy dissipaters often consist of boulders larger than the RSP. The rock energy dissipaters are placed in the outflow channel to further dissipate energy of the existing flow.

A downdrain is used to convey storm runoff down sloped areas (often cut or fill slopes) into a stabilized watercourse. Downdrains are installed perpendicular to slope contours. Soil is compacted around and under the entrance and exit of the pipe, and along its length, and the pipe is anchored to the soil and stabilized. This further ensures the avoidance of a scour channel at the site where water is discharged from the conveyance structures.

Caltrans installs on average approximately 350 culverts each year within the coverage area, with less than 100 culverts installed within fish bearing streams, including streams that support anadromous fish. Some years large culvert rehabilitation projects come through and greater numbers are replaced. A recent example would be a project with 200 plus culverts, six of which involved fish streams where fish passage improvements were part of the design. Historically, the more culverts that are replaced, the more fish passage locations are remediated. Culverts range in diameter from 18 inches to 12 feet. Culverts may exceed 70 feet in length. Culvert removal and installation may span several days or weeks for small culverts and more than 3 months for large, complex installations. Replacement activities for individual culverts generally take place once every 20 to 50 years.

Generally, culvert cleaning requires a shovel, rake, or other hand tools to remove debris that becomes lodged at the culvert inlet. At times heavy equipment may be required, depending upon the nature and extent of the material blocking the culvert inlet. Culvert cleaning can require minutes or several hours to complete and require the use of heavy machinery to complete. Culvert retrofitting generally requires the use of heavy equipment operating below the OHWL and can take from one to several days to complete, depending upon the complexity of the retrofit. Culvert installation will require the use of heavy equipment such as backhoe, bull dozer, dump trucks, and paving equipment. Culvert installation actions generally require one to 14 days to complete, depending upon the complexity of the installation and traffic detours that may be required. Table 5-54 below provides the anticipated frequency of PA-23 each year within the Caltrans Districts covered.

Table 5-54. Annual Frequency of PA-23 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-23: Clean, Retrofit and Install Culverts	**3000**	**120**	**9,195**
Clean	***3000***	***460***	***8,459***
Non-Fish Bearing – in-the-dry	*1500*	*120*	*4,230*
Non-Fish Bearing – in-water	*1300*	*70*	*3,806*
Fish Bearing – in-the-dry	*150*	*100*	*254*
Fish Bearing – in-water	*50*	*70*	*169*
Retrofit	***115***	***20***	***115***
Non-Fish Bearing – in-the-dry	*80*	*5*	*80*
Non-Fish Bearing – in-water	*25*	*5*	*25*
Fish Bearing – in-the-dry	*5*	*5*	*5*
Fish Bearing – in-water	*5*	*5*	*5*
Install [a]	135	85	130
Non-Fish Bearing – in-the-dry	*60*	*30*	*60*
Non-Fish Bearing – in-water	*45*	*30*	*45*
Fish Bearing – in-the-dry	*20*	*15*	*20*
Fish Bearing – in-water	*10*	*10*	*5*

[a] Estimated number of installed culverts equal to estimated number removed per PA-22.

Table 5-55 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-23. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-55. Approved Best Management Practices for PA-23

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Material and equipment use over water	N/A	NS-13
Concrete finishing	N/A	NS-14

[a] Appendix C provides detailed descriptions of each BMP.

A total of 16 ABMPs have been developed for PA-23:

- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats
- **ABMP-14.1:** Work will be conducted only in dry stream beds (dewatered) or within cofferdams.
- **ABMP-14.5:** If any life stage of any listed species may be present during in-water activities or substantial disturbance, then capture, handling, exclusion, salvage, and relocation will be considered for the listed species
- **ABMP-14.6:** Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, all in-water activities will be conducted outside the spawning and incubation season for listed fish species or to periods identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions
- **ABMP-14.7:** Modified or disturbed portions of streams, banks, and riparian areas will be restored as nearly as possible to natural and stable contours (elevations, profile, and gradient)
- **ABMP-15.1:** Stream width, depth, velocity, and slope that provide upstream and downstream passage of adult and juvenile fish will be preserved according to current NMFS and DFG guidelines and criteria or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions
- **ABMP-17.2:** Immediately upon completion of in-channel work, temporary fills, cofferdams, diversion cofferdams, and other in-channel structures will be removed in a manner that minimizes disturbance to downstream flows and water quality
- **ABMP-17.3:** All structures and imported materials placed in the stream channel or on the banks during construction that are not designed to withstand high flows will be removed before such flows occur
- **ABMP-20.1:** Extension of existing areas of stream bank RSP or other bank protection (e.g., sheet piles) will be avoided and the extent of bank and channel armoring will be limited to the minimum necessary to protect essential infrastructure
- **ABMP-20.3:** Bank stabilization incorporates bioengineering solutions consistent with site-specific engineering requirements

- **ABMP-20.4:** Where RSP is necessary, native riparian vegetation and/or LWD in RSP will be incorporated
- **ABMP-20.6:** RSP, sheet piles, and other erosion control materials will be pre-washed to remove sediment and/or contaminants
- **ABMP-20.7:** Temporary material storage piles (e.g., RSP) will not be placed in the 25-year floodplain during the rainy season, unless no rain is forecast and material is used within 12 hours of deposition.
- **ABMP-23.1:** Stream flow through new and replacement culverts, bridges, and over stream gradient control structures must meet the velocity depth, and other passage criteria for salmonid streams as described by the current NMFS and DFG guidelines or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions
- **ABMP-23.2:** Culverts may be replaced with small bridges
- **ABMP-23.3:** Scour holes at the base of bridge piers or abutments and culvert inlets and outlets will be repaired by placing no more riprap (RSP) than is necessary to mitigate the scour

PA-24: Install Fishways or Stream Gradient Control Structures

Stream gradient control structures may be necessary downstream or upstream of bridges and culverts or in association with RSP to reduce erosion and scour or down-cutting of the stream channel. Gradient control structures trap sediment and stabilize the channel. They may be constructed of concrete, rock, or other appropriate material (e.g., logs). Extension of foundation footings into the channel bank will depend on site characteristics. Gradient control structures will be constructed using front-end loaders, backhoes, and other equipment. The design of bridges and culverts will consider hydraulic effects (e.g., hydraulic design method) of fishways or stream gradient control structures, both upstream and downstream of the structures. Water surface elevations in the stream reach must exhibit gradual flow transitions, both upstream and downstream, under a range of flow conditions. Abrupt changes in water surface and velocities must be avoided, with no hydraulic jumps, turbulence, or drawdown at the entrance. A continuous low-flow channel must be maintained throughout the entire affected stream reach. In addition, designs need to maintain or provide resting pools, concentrate low flows, prevent erosion of streambed or banks, and allow passage of bedload material. Depending on the stream length affected by gradient control structures, natural sinuosity of the stream may be lost and sediment transport problems may occur even if the slopes remain constant. Such problems should be anticipated and mitigated in the project design. Up to 75 fishways or stream gradient control structures are installed in streams each year within the coverage area. Most streams affected are less than 10 feet wide.

Installing gradient control structures, or fishways, generally require 1–2 weeks to complete, depending upon several factors (e.g., stream size, access, number and complexity of structures). These projects generally occur in small streams, less than 10 feet wide, and have a relatively small footprint, extending up to 100 feet thereby affecting approximately 1,000 square feet of stream. Table 5-56 below provides the anticipated frequency of PA-24 each year within the Caltrans Districts covered.

Table 5-56. Annual Frequency of PA-24 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-24: Install fishways or stream gradient control structures	25	25	25

Table 5-57 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-24. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-57. Approved Best Management Practices for PA-24

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Material and Equipment Use Over Water	N/A	NS-13

[a] Appendix C provides detailed descriptions of each BMP.

A total of 14 ABMPs have been developed for PA-24:

- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats
- **ABMP-14.1:** Work will be conducted only in dry stream beds or within cofferdams.
- **ABMP-14.5:** If any life stage of any listed species may be present during in-water activities or substantial disturbance, then capture, handling, exclusion, salvage, and relocation will be considered for the listed species
- **ABMP-14.6:** Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, all in-water activities will be conducted outside the spawning and incubation season for listed fish species or to periods identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions
- **ABMP-14.7:** Modified or disturbed portions of streams, banks, and riparian areas will be restored as nearly as possible to natural and stable contours (elevations, profile, and gradient)
- **ABMP-15.1:** Stream width, depth, velocity, and slope that provide upstream and downstream passage of adult and juvenile fish will be preserved according to current NMFS and DFG guidelines and criteria or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions
- **ABMP-17.2:** Immediately upon completion of in-channel work, temporary fills, cofferdams, diversion cofferdams, and other in-channel structures will be removed in a manner that minimizes disturbance to downstream flows and water quality
- **ABMP-17.3:** All structures and imported materials placed in the stream channel or on the banks during construction that are not designed to withstand high flows will be removed before such flows occur

- **ABMP-20.1:** Extension of existing areas of stream bank RSP or other bank protection (e.g., sheet piles) will be avoided and the extent of bank and channel armoring will be limited to the minimum necessary to protect essential infrastructure
- **ABMP-20.3:** Bank stabilization will incorporate bioengineering solutions consistent with site-specific engineering requirements
- **ABMP-20.4:** Where RSP is necessary, native riparian vegetation and/or LWD in RSP will be incorporated
- **ABMP-20.6:** RSP, sheet piles, and other erosion control materials will be pre-washed to remove sediment and/or contaminants
- **ABMP-20.7:** Temporary material storage piles (e.g., RSP) will not be placed in the 100-year floodplain during the rainy season, unless no rain is forecast and material is used within 12 hours of deposition
- **ABMP-23.1:** Stream flow through new and replacement culverts, bridges, and over stream gradient control structures must meet the velocity depth, and other passage criteria for salmonid streams as described by the current NMFS and DFG guidelines or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions

PA-25: Remove Existing Bridge Structure, Including Footings, Piers, and Piles

Existing bridges must generally be removed before installing replacement bridges. Existing bridge materials that are to be salvaged will be carefully removed and stockpiled near the site at a location designated by the engineer. Piling, piers, abutments and pedestals will be removed to at least 1-foot below the ground line or 3 feet below the finished grade, whichever is lower. Pile removal may require the use of an underwater hydraulic chainsaw, flame cutters, or other equipment. Cutting may be supported by a small boat. Cutting time varies depending on pile diameter and material, with wooden piles requiring a few minutes and larger-diameter metal piling requiring 30+ minutes. Vactoring may also be used to remove sand around exposed piles above the low-water elevation to enable a greater pile removal depth.

Flame and saw cutting may be used for removing, widening, or modifying bridges, provided the contractor complies with all protection, safety, and damage requirements. When portions of a bridge are to be removed, the removal operations will be performed without damage to any portion of the structure that is to remain in place. Existing reinforcement that is to be incorporated in new work will be protected from damage and will be cleaned thoroughly of all adhering material before being embedded in new concrete. Before beginning concrete removal operations involving the removal of a portion of a monolithic concrete element, a saw cut approximately 1-inch deep will be made to a true line along the limits of removal on faces of the element that will be visible in the completed work. Broken concrete will be disposed of off-site at an approved facility. Explosives will not be used for bridge removal.

Caltrans removes up to 35 bridges within the coverage area each year. Bridge lengths range from 75 to 200 feet and widths vary from 35 to 40 feet. Removal activities generally take place during the dry months. Work below the OHWL is generally limited to the area in immediate proximity to the bridge structure, associated with abutments and support piling. The area of the active channel below the OHWL varies depending upon the size of the bridge but generally ranges

from 100 to 1,000 square feet. Table 5-58 below provides the anticipated frequency of PA-25 each year within the Caltrans Districts covered.

Table 5-58. Annual Frequency of PA-25 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-25: Remove existing bridge structure, including footings, piers, and piles	15	10	10

Table 5-59 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-25. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-59. Approved Best Management Practices for PA-25

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Material use	C.14.2	WM-2
Solid waste management	C.13.2	WM-5
Structure demolition and removal over or adjacent to waters	N/A	NS-15
Concrete waste management	C.13.7	WM-8

[a] Appendix C provides detailed descriptions of each BMP.

Six ABMPs have been developed for PA-25:

- **ABMP-6.1:** Falsework will be installed to keep bridge debris and construction, maintenance, and repair materials from falling into streams during demolition, construction, and substantial maintenance and repair activities
- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats
- **ABMP-14.1:** Work will be conducted only in dry stream beds (dewatered) or within cofferdams.
- **ABMP-14.5:** If any life stage of any listed species may be present during in-water activities or substantial disturbance, then capture, handling, exclusion, salvage, and relocation will be considered for the listed species
- **ABMP-14.6:** Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, all in-water activities will be conducted outside the spawning and incubation season for listed fish species or to periods identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions
- **ABMP-15.1:** Stream width, depth, velocity, and slope that provide upstream and downstream passage of adult and juvenile fish will be preserved according to current NMFS and DFG guidelines and criteria or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions

PA-26: Install Bridge Structures, Excluding Pile Driving

Bridge installation and retrofitting may include construction of spans and piers. The design of the bridge, including the span length, will depend on specific site conditions. Construction activities may include widening existing piers and installing new piers. Temporary piers, columns, and trestles may be required to facilitate bridge construction. Cofferdams may be placed around the piers. No pile-driving is covered under this PBA. Enlarging the footings may require placing a sheet pile cofferdam around the footing, excavating to the bottom of the footing, and expanding the footing with rebar and concrete. The bridge superstructures are generally cast concrete and steel. Replacement and retrofitting may require Portland cement concrete and steel reinforcement. Reinforcing steel will be placed as shown on plans and held securely in position when placing concrete. Forms will be constructed adequately to prevent leaks and to hold in proper line and grade while placing and curing the concrete.

Caltrans installs up to 35 bridges (all or sections) within the project area each year. Bridge lengths range from 75 to 200 feet, and widths vary from 35 to 40 feet. Construction activities may take place over several months or 1 to 2 years, depending on the size and complexity of the project. Actual construction is usually during dry months and encompasses 6 to 12 months for larger projects. Removal activities generally take place during the dry months. Work below the OHWL is generally limited to the area in immediate proximity to the bridge structure, associated with abutments and support piling. The area of the active channel below the OHWL varies depending upon the size of the bridge but generally ranges from 100 to 1,000 square feet. Table 5-60 below provides the anticipated frequency of PA-26 each year within the Caltrans Districts covered.

Table 5-60. Annual Frequency of PA-26 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-26: Install bridge structures, excluding impact pile-driving	15	10	10

Table 5-61 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-26. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-61. Approved Best Management Practices for PA-26

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Material use	C.14.2	WM-2
Solid waste management	C.13.2	WM-5
Material and equipment use over water	N/A	NS-13

[a] Appendix C provides detailed descriptions of each BMP.

A total of 16 ABMPs have been developed for PA-26:

- **ABMP-6.1:** Falsework will be installed to keep bridge debris and construction, maintenance, and repair materials from falling into streams during demolition, construction, and substantial maintenance and repair activities
- **ABMP-10.4:** Environmentally Sensitive Areas will be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats
- **ABMP-14.1:** Work will be conducted only in dry stream beds or within cofferdams.
- **ABMP-14.5:** If any life stage of any listed species may be present during in-water activities or substantial disturbance, then capture, handling, exclusion, salvage, and relocation will be considered for the listed species
- **ABMP-14.6:** Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, all in-water activities will be conducted outside the spawning and incubation season for listed fish species or to periods identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions
- **ABMP-14.7:** Modified or disturbed portions of streams, banks, and riparian areas will be restored as nearly as possible to natural and stable contours (elevations, profile, and gradient)
- **ABMP-15.1:** Stream width, depth, velocity, and slope that provide upstream and downstream passage of adult and juvenile fish will be preserved according to NMFS and DFG guidelines and criteria or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions
- **ABMP-17.2:** Immediately upon completion of in-channel work, temporary fills, cofferdams, diversion cofferdams, and other in-channel structures will be removed in a manner that minimizes disturbance to downstream flows and water quality
- **ABMP-17.3:** All structures and imported materials placed in the stream channel or on the banks during construction that are not designed to withstand high flows will be removed before such flows occur
- **ABMP-20.1:** Extension of existing areas of stream bank RSP or other bank protection (e.g., sheet piles) will be avoided and the extent of bank and channel armoring will be limited to the minimum necessary to protect essential infrastructure
- **ABMP-20.3:** Bank stabilization will incorporate bioengineering solutions consistent with site-specific engineering requirements
- **ABMP-20.4:** Where RSP is necessary, native riparian vegetation and/or LWD in RSP will be incorporated
- **ABMP-20.6:** RSP, sheet piles, and other erosion control materials will be pre-washed to remove sediment and/or contaminants
- **ABMP-20.7:** Temporary material storage piles (e.g., RSP) will not be placed in the 100-year floodplain during the rainy season, unless no rain is forecast and material is used within 12 hours of deposition

- **ABMP-23.1:** Stream flow through new and replacement culverts, bridges, and over stream gradient control structures must meet the velocity depth, and other passage criteria for salmonid streams as described by NMFS and DFG guidelines or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions
- **ABMP-23.3:** Scour holes at the base of bridge piers or abutments and culvert inlets and outlets will be repaired by placing no more riprap (RSP) than is necessary to mitigate the scour

PA-27: Blast Rock and Other Substrate

Limited blasting may be necessary for replacement of bridges and culverts where rocky material precludes use of other methods of grading and site preparation. Blasting may encompass drilling into the targeted substrate, loading a charge in a hole, and back-filling with angular gravel to the level of the substrate or by collapsing the hole to confine the force of the explosion to the formation fractured. All “shock-tubes” and detonation wires will be recovered and removed after each blast.

In general, this PA is not a commonly used activity, used an estimated 145 times each year within the coverage area. This contradicts the frequency presented in Table 5-62 below, as the frequency numbers were derived based on the frequency of the SSPs for which PA-27 may be required. Blasting is not employed within surface waters, but may occur adjacent to surface waters. Table 5-62 below provides the anticipated frequency of PA-27 each year within the Caltrans Districts covered.

Table 5-62. Annual Frequency of PA-27 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-27: Blast rock and other substrate	65	20	60

Table 5-63 lists the codes for the standard maintenance and construction site BMPs that will be implemented to avoid or minimize impacts from PA-27. Detailed descriptions of each BMP are provided in Appendix C.

Table 5-63. Approved Best Management Practices for PA-27

Activities	Maintenance BMPs[a]	Construction Site BMPs[a]
Material use	C.14.2	WM-2
Solid waste management	C.13.2	WM-5
Structure demolition and removal over or adjacent to waters	N/A	NS-15
Concrete waste management	C.13.7	WM-8

[a] Appendix C provides detailed descriptions of each BMP.

ABMPs developed for PA-27 include:

- **ABMP-14.5:** If any life stage of any listed species may be present during in-water activities or substantial disturbance, then capture, handling, exclusion, salvage, and relocation will be considered for the listed species
- **ABMP-27.1:** The use of potentially less destructive methods will be considered and blasting avoided wherever possible
- **ABMP-27.2:** Blasting will be conducted outside of the stream channel or under dry channel conditions; blasts will be controlled to prevent flying debris from entering streams
- **ABMP-27.3:** Use of explosives will not be permitted during the spawning or incubation period of any listed fish species
- **ABMP-27.4:** Prior to use of any explosives, Caltrans will contact NOAA fisheries, USFWS, and DFG and identify the species and habitats at risk and effective mitigation measures

PA-28: Capture, Handle, Exclude, Salvage, and Relocate Listed Species

Capture, handling, exclusion, salvage, and relocation activities depend on the species and life stage. The need for species capture and relocation depends on the project and site. The most common need for species capture and relocation emerges with installation of cofferdams that isolate work areas for placement of RSP; removal, installation, and repair of culverts; and removal, installation, and repair of bridges. Cofferdams constructed within stream channels can entrap listed fish species and cause mortality unless fish exclusion and removal efforts are carried out. Listed fish species entrapped within cofferdams need to be relocated. Caltrans conducts fish salvage and relocation activities for routine and minor projects as needed.

Activities that may require exclusion of listed fish species could include pile-driving, blasting, and operation of equipment within the stream channel. Organisms other than fish may require capture and relocation, including listed amphibians and reptiles. The need for capture, handling, exclusion, salvage, and relocation activities depends on the occurrence of species within the project footprint for the covered activities and the likelihood of injury and death.

In general fish removal and exclusion activities affect an area larger than the activity they are associated with. It is estimated that the area affected by this PA will be 10% larger than the area affected by the associated SSP (e.g., SSPA-3.4: Replacement, repair and retrofitting of culverts). Table 5-64 below provides the maximum frequency PA-28 may be implemented each year within the Caltrans Districts covered. However, it should be noted that is expected that this PA will be implemented at a frequency substantially less than the maximum numbers provided in the table.

Table 5-64. Annual Frequency of PA-28 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-28: Capture, handle, exclude, salvage, and relocate listed species	2	1	2

Note –, implementation of PA-28 should be extremely rare with less than 1% of the SSPs for which PA-28 are associated are anticipated to require the implementation of this PA. Worst case conditions, during extremely wet years, could result in a four-fold increase in the number of times PA-28 would be required.

There are no standard BMPs for PA-28. However, 12 ABMPs have been developed for PA-28:

- **ABMP-28.1:** If individuals of listed species may be present and subject to potential injury or mortality from construction activities, a qualified biologist will conduct a preconstruction survey
- **ABMP-28.2:** Minimum qualifications for the qualified biologist will include a 4-year college degree in biology or related field, and 2 years of professional experience in the application of standard survey, capture, and handling methods for the species of concern
- **ABMP-28.3:** When listed species are present and it is determined that they could be injured or killed by construction activities, a qualified biologist will identify appropriate methods for capture, handling, exclusion, and relocation of individuals that could be affected
- **ABMP-28.4:** Where listed species cannot be captured, handled, excluded, or relocated (e.g., salmonid redd), actions that could injure or kill individual organisms will be avoided or delayed until the species leaves the affected area or the organism reaches a stage that can be captured, handled, excluded, or relocated
- **ABMP-28.5:** The project biologist will conduct, monitor, and supervise all capture, handling, exclusion, and relocation activities; the project biologist will ensure that sufficient personnel are available for safe and efficient collection of listed species; and will ensure that proper training of personnel has been conducted in identification and safe capture and handling of listed species
- **ABMP-28.6:** Electrofishing may be allowed only if all other standard fish capture methods would be ineffective; the project biologist must have appropriate training and experience in electrofishing techniques
- **ABMP-28.7:** Individual organisms will be relocated the shortest distance possible to habitat unaffected by construction activities
- **ABMP-28.8:** Within occupied habitat, capture, handling, exclusion, and relocation activities will be completed no earlier than 48 hours before construction begins to minimize the probability that listed species will recolonize the affected areas
- **ABMP-28.9:** Within temporarily drained stream channel areas, salvage activities will be initiated before or at the same time as stream area draining and completed within a time frame necessary to avoid injury and mortality of listed species
- **ABMP-28.10:** For projects that involve in-water activities, the project biologist will continuously monitor in-water activities (e.g., placement of cofferdams, dewatering of isolated areas) for the purpose of removing and relocating any listed species that were not detected or could not be removed and relocated prior to construction
- **ABMP-28.11:** The project biologist will be present at the work site until all listed species have been removed and relocated
- **ABMP-28.12:** The project biologist will maintain detailed records of the species, numbers, life stages, and size classes of listed species observed, collected, relocated, injured, and killed; as well as recording the date and time of each activity or observation

PA-29: Implement Best Management Practices

As part of implementing PAs, Caltrans commits to implementing practicable BMPs identified in the project description and as identified in related biological opinions by USFWS, NMFS, and DFG. As part of this commitment, a guidance document will be developed in cooperation with USFWS, NMFS, the Corps, and FHWA to ensure compliance with project permits and authorization, including implementation of the BMPs and ABMPs. Table 5-65 below provides the anticipated frequency of PA-29 each year within the Caltrans Districts covered.

Table 5-65. Annual Frequency of PA-29 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-29: Implement Best Management Practices	9,000	1,000	10,000

There are no standard BMPs for PA-29. However, seven ABMPs have been developed for PA-29:

- **ABMP-29.1:** The guidance document will be followed, which will be developed in cooperation with NMFS, USFWS, Corps, and FHWA, to ensure compliance with Project permits and authorization, including implementation of the BMPs
- **ABMP-29.2:** Before construction activities begin, the project environmental coordinator or biologist will discuss the implementation of the required BMPs with the maintenance crew or construction resident engineer and contractor, and identify and document environmentally sensitive areas and potential occurrence of listed species
- **ABMP-29.3:** Before construction activities begin, the project environmental coordinator or biologist will conduct a worker awareness training session for all construction personnel that describes the listed species and their habitat requirements, the specific measures being taken to protect individuals of listed species in the project area, and the boundaries within which project activities will be restricted
- **ABMP-29.4:** Caltrans will designate a biological monitor to monitor on-site compliance with all Project BMPs and any unanticipated effects on listed species
- **ABMP-29.5:** Non-compliance with BMPs and unanticipated effects on listed species will be reported to the resident engineer or maintenance supervisor immediately
- **ABMP-29.6:** When non-compliance is reported, the resident engineer or maintenance supervisor will implement corrective actions immediately to meet all BMPs; where unanticipated effects on listed species cannot be immediately resolved, the resident engineer or maintenance supervisor will stop work that is causing the unanticipated effect
- **ABMP-29.7:** If unanticipated effects on listed species violate the terms and conditions in the BO or other confirmed take authorization, NMFS, USFWS, and DFG will be notified as soon as is reasonably possible; modifications to project activities may be developed to prevent continued unanticipated effects.

PA-30: Mitigation framework for potential adverse impacts on species listed under CESA

As part of the PBA, Caltrans will mitigate adverse impacts (i.e., take) of species listed under the CESA and in some cases CEQA. The mitigation approach will generally be to offset the anticipated adverse impacts either through restoring in-stream habitat (i.e., placement of LWD or gravel/rock/boulders), restoring or enhancing riparian habitat conditions, or improving fish passage. This approach will improve both terrestrial and aquatic habitat conditions. In some cases impacts will be mitigated by means of aquatic and upland habitat improvements. Caltrans will coordinate closely with DFG to ensure that mitigation identified is appropriate for the impacts identified and the species affected.

In general, the work that will be required to complete an individual mitigation project has been covered under this PBA previously (e.g., culvert removal and installation, equipment operation). Physical work will be required to restore physical habitat, but the activities required are covered under this PBA, and the implementation of this PA will occur at sites where Caltrans determines that one or more mitigation approaches can be implemented at a site to improve habitat conditions without causing any greater level of impact on covered species or their habitat. At the start of each Caltrans fiscal year, Caltrans will identify the number and type of SSPs covered under the PBA that the agency anticipates implementing during that year within the covered area of Districts 1, 2, and 4. Caltrans will determine the anticipated level of take associated with those projects and the watersheds in which they will occur. Caltrans will then work to identify up to 10 potentially suitable mitigation options per district and present the DFG with a recommendation of which options are most appropriate to offset the anticipated level of take for the year. Table 5-66 below provides the anticipated frequency of PA-30 each year within the Caltrans' districts covered.

Table 5-66. Annual Frequency of PA-30 per Caltrans District

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4
PA-30: Mitigation framework for potential adverse impacts on species listed under CESA	10	10	10

No BMPs or ABMPs have been developed for this PA.

Chapter 6 Analysis of Effects

6.1 Introduction

This chapter describes the potential direct and indirect effects on the covered species that could result from implementation of the CAs, as well as the effects of interrelated or interdependent actions, and cumulative effects. These types of effects are defined below:

- **Direct effects** result from actions that could modify habitat, harm or harass species, or modify designated critical habitat, including beneficial and negative effects.
- **Indirect effects** are caused by the action and occur later in time, but are still reasonably certain to occur. Indirect effects may include impacts on food resources or foraging areas and impacts from increased long-term human access.
- **Effects of interdependent or interrelated actions** are result from actions that 1) have no independent utility apart from the primary action, 2) are part of a larger action and depend on the larger action for their justification, or 3) are required as part of the larger action, including maintenance and operation.
- **Cumulative effects** occur because of future state or private activities, not involving federal actions that are reasonably certain to occur within the project action area.

The analysis of effects accounts for the potential impacts that will result from implementation of the PAs, relative to the scale of the SSPs for which specific PAs that are necessary to complete the SSP will be implemented. Identified effects are divided into effects on covered species and effects on the Primary Constituent Elements (PCEs) of designated critical habitat, and are described in relation to the principle impact mechanisms—for example, equipment operation, temporary ingress and egress of equipment (i.e., the temporary movement of construction equipment and personnel into and out of an area during the completion of CAs), and noise and visual disturbance—that will result in a potential effect on listed species or critical habitat (e.g., changes in water quality or habitat conditions). These effects are lumped into general "bins" (i.e., *No Effect*, *May Affect, Not Likely to Adversely Affect* and *May Affect, Likely to Adversely Affect*) in this chapter, and are categorized into specific determinations for each of the covered species in Chapter 7.

The Magnuson-Stevens Act requires consultation for all federal agency actions that may adversely affect Essential Fish Habitat (EFH). EFH consultation with NMFS is required by federal agencies undertaking, permitting, or funding activities that may adversely affect EFH, regardless of its location. Wherever possible, NMFS utilizes existing interagency coordination processes to fulfill EFH consultations with federal agencies. For the covered activities, this goal is being met by incorporating EFH consultation to the Programmatic Endangered Species Act Section 7 consultation, as represented in Appendix D of this PBA.

Additionally, as part of this PBA, an assessment of the level of take that may occur as a result of the implementation of the activities covered under this PBA has been prepared and is provided in Appendix E.

6.1.1 Impact Mechanisms

Table 6-1 lists the PAs presented in this PBA, potential impact mechanisms typically associated with each PA, and direct and indirect effects that could potentially result from implementing each PA. One or more of these PAs will be required to implement each of the SSPs, as indicated in Table 5-1 in Chapter 5.

Table 6-1. Site-Specific Projects, Impact Mechanisms, and Potential Direct and Indirect Effects

Project Action	Potential Impact Mechanisms	Potential Direct Effects	Potential Indirect Effects
PA-1:Operate construction equipment and vehicles	▪ Equipment operation ▪ Excavation/fill ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-2: Use temporary lighting for night construction activities	▪ Equipment operation	▪ Auditory, visual, or vibratory disturbance	▪ Behavioral modifications
PA-3: Maintain and fuel construction equipment and vehicles	▪ Equipment operation	▪ Water quality	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-4: Clean the roadway of sediment and debris during and following maintenance and construction activities	▪ Equipment operation	▪ Water quality ▪ Auditory, visual, or vibratory disturbance	▪ Indirect effects from water quality changes or displacement and exposure
PA-5: Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance	▪ Indirect effects from water quality changes or displacement and exposure
PA-6: Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure	▪ Equipment operation	▪ Water quality ▪ Auditory, visual, or vibratory disturbance	▪ Indirect effects from water quality changes or displacement and exposure
PA-7: Treat and discharge water conveyed from the construction area	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal ▪ Hydraulic modification	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance	▪ Indirect effects from water quality changes or displacement and exposure

Table 6-1. Site-Specific Projects, Impact Mechanisms, and Potential Direct and Indirect Effects

Project Action	Potential Impact Mechanisms	Potential Direct Effects	Potential Indirect Effects
PA-8: Use drill rigs and drilling lubricants	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal ▪ Fish exclusion and handling	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-9: Paint, wash, seal, and caulk bridges, guardrails, and other infrastructure	▪ Equipment operation	▪ Water quality ▪ Auditory, visual, or vibratory disturbance	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-10: Remove and disturb upland, riparian, and wetland vegetation	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal ▪ Hydraulic modification	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-11: Grade and establish temporary and permanent storage areas for sediment, debris, and construction materials	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance	▪ Behavior modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-12: Construct temporary sediment-settling basins	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-13: Grade temporary access roads, traffic detours, and staging and work areas	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-14: Operate construction equipment and vehicles in the stream channel	▪ Equipment operation ▪ Temporary ingress or egress ▪ Hydraulic modification ▪ Fish exclusion and handling	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure

Table 6-1. Site-Specific Projects, Impact Mechanisms, and Potential Direct and Indirect Effects

Project Action	Potential Impact Mechanisms	Potential Direct Effects	Potential Indirect Effects
PA-15: Construct temporary stream crossings	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal ▪ Hydraulic modification ▪ Fish exclusion and handling	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-16: Remove and disturb aquatic vegetation, stream sediment, and LWD	▪ Equipment operation ▪ Excavation/fill ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal ▪ Hydraulic modification ▪ Fish exclusion and handling	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-17: Install temporary cofferdams and diversion cofferdams	▪ Equipment operation ▪ Excavation/fill ▪ Blasting ▪ Temporary ingress or egress ▪ Hydraulic modification ▪ Fish exclusion and handling	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-18: Temporarily redirect stream flow	▪ Equipment operation ▪ Excavation/fill ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal ▪ Hydraulic modification ▪ Fish exclusion and handling	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-19: Temporarily draft water from streams and other water bodies	▪ Equipment operation ▪ Hydraulic modification ▪ Fish exclusion and handling	▪ Water quality ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Indirect effects from water quality changes or displacement and exposure

Table 6-1. Site-Specific Projects, Impact Mechanisms, and Potential Direct and Indirect Effects

Project Action	Potential Impact Mechanisms	Potential Direct Effects	Potential Indirect Effects
PA-20: Install permanent and temporary RSP, sheet piles, and retaining walls	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance	▪ Indirect effects from water quality changes or displacement and exposure
PA-21: Place concrete and concrete slurry seal coat in cofferdams, footing and bridge forms	▪ Equipment operation	▪ Water quality ▪ Auditory, visual, or vibratory disturbance	▪ Indirect effects from water quality changes or displacement and exposure
PA-22: Remove culverts	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal ▪ Hydraulic modification ▪ Fish exclusion and handling	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Indirect effects from water quality changes or displacement and exposure
PA-23: Clean, retrofit, or install culverts	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation Disturbance or removal ▪ Hydraulic modification ▪ Fish exclusion and handling	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-24: Install fishways or streams gradient control structures	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal ▪ Hydraulic modification ▪ Fish exclusion and handling	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure

Table 6-1. Site-Specific Projects, Impact Mechanisms, and Potential Direct and Indirect Effects

Project Action	Potential Impact Mechanisms	Potential Direct Effects	Potential Indirect Effects
PA-25: Remove existing bridge structure, including footings, piers, and piles	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal ▪ Hydraulic modification ▪ Fish exclusion and handling	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-26: Install bridge structures, excluding impact pile-driving	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal ▪ Hydraulic modification ▪ Fish exclusion and handling	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Behavior modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-27: Blast rock and other substrate	▪ Equipment operation ▪ Temporary ingress or egress ▪ Vegetation disturbance or removal	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-28: Capture, handle, exclude, salvage, and relocate listed species	▪ Fish exclusion and handling	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance ▪ Disturbance or injury	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-29: Implement BMPs	▪ Avoidance and minimization of direct impacts	▪ Water quality ▪ Habitat modification ▪ Auditory, visual, or vibratory disturbance	▪ Behavioral modifications ▪ Indirect effects from water quality changes or displacement and exposure
PA-30: Mitigation framework for potential adverse impacts on species listed under the CESA	▪ Increase potential habitat gain	▪ Increased capacity	▪ Increased productivity

The sections below describe the direct and indirect effects of the PAs, the effects of interrelated and interdependent actions, and cumulative effects.

6.2 Direct Effects

Direct effects are defined as those impacts caused by the action that occur at the same time and place as the action. Direct effects include all immediate impacts (negative and beneficial) from

project-related actions (e.g., construction-related impacts such as noise disturbance or loss of habitat) and disturbances directly related to project elements that occur relatively close to the time of the action itself (e.g., increased turbidity or sedimentation). The direct effects that could potentially result from implementing the PAs necessary to complete the SSPs proposed in this PBA include:

- **Water Quality:** Specifically, impacts on turbidity levels, chemical contaminants from accidental petroleum spills, exposure of surface waters to uncured concrete, or fracout or spill of drilling muds to surface waters, and effects on water temperature.
- **Habitat Modification:** Specifically, impacts via sedimentation; disturbance of upland, shoreline, riparian, and aquatic vegetation; and alteration of channel morphology and hydraulics.
- **Auditory, Visual, or Vibratory Disturbance:** For example, disturbance from construction related activities associated with elevated noise levels, vibrations, or artificial lighting.
- **Disturbance or Injury:** Specifically, disturbance, behavioral changes, stress, or injury resulting from the exclusion, removal, capture, and handling of fish.

Each of these potential direct effects is described in detail below.

6.2.1 Water Quality

Impacts on water quality that could occur as a result of implementing the PAs include increased turbidity, chemical contamination, and changes in water temperature. Caltrans will implement the appropriate BMPs and ABMPs to avoid or minimize potential impacts on water quality and will comply with all applicable water quality standards and other permit and regulatory requirements and conditions during construction.

The PAs that may impact water quality if implemented include:

- PA-1
- PA-3
- PA-4
- PA-5
- PA-6
- PA-7
- PA-8
- PA-9
- PA-10
- PA-11
- PA-12
- PA-13
- PA-14
- PA-15
- PA-16
- PA-17
- PA-18
- PA-19
- PA-20
- PA-21
- PA-22
- PA-23
- PA-24
- PA-25
- PA-26
- PA-27
- PA-28
- PA-29

Increased Turbidity

Source of Impact and PAs Involved

Ground disturbance, soil placement, and relocation of soils and materials during implementation of PAs, especially those that require in-water work or work below the ordinary high water line

(OHWL), can potentially result in particle suspension that can increase turbidity levels within the water column. A total of 23 PAs presented in this PBA could result in increased turbidity to levels that could potentially affect the covered species should those PAs be implemented in waters that contain such species or if they are implemented during periods when such species are present. These PAs include:

- PA-1
- PA-4
- PA-5
- PA-7
- PA-8
- PA-10
- PA-11
- PA-12
- PA-13
- PA-14
- PA-15
- PA-16
- PA-17
- PA-18
- PA-19
- PA-20
- PA-22
- PA-23
- PA-24
- PA-25
- PA-26
- PA-27
- PA-29
-

The intensity, duration and potential impact of elevated turbidity depends upon the existing background turbidity levels, composition of suspended materials, area and degree of disturbance, quantity of the sediments suspended, and volume and velocity of the receiving water in the affected area (National Marine Fisheries Service 2001).

Range of Effects

Determining background turbidity levels is a difficult process confounded by the inconsistency in measurement methods and natural environmental variation in factors contributing to turbidity levels (Bash et al. 2001). Turbidity often varies temporally with variations in precipitation, runoff, and discharge regimes as erosion and transport of suspended material varies. Turbidity may also vary spatially between or within watersheds because of variations in geology, land use, and water velocity. For example, glacial streams have naturally elevated turbidity levels compared to non-glacial streams, and estuaries and lower reaches of streams tend to have higher turbidity than their headwaters (Lloyd et al. 1987). Widespread, continuous sampling throughout the coverage area would be required to determine a reasonable estimate of natural background turbidity levels (Bash et al. 2001).

Turbidity has been linked to a number of behavioral and physiological responses in salmon (e.g., gill flaring, coughing, avoidance of the area, and increased blood sugar levels) that indicate some level of stress (Berg and Northcote 1985; Servizi and Martens 1992**)**. High levels of suspended solids can be fatal, while lower levels can cause sub-lethal or behavioral effects such as reduced foraging efficiencies and growth levels, lowered resistance to disease, and impaired homing and migration abilities (Lloyd 1987, in Bash et al. 2001). Substantial increases in turbidity can also result in smothering of benthic organisms and communities, and reduction in the levels of dissolved oxygen in the water column, therein altering the suitability of spawning areas in the environment (Martin et al. 1977; Carrasquero 2001; Mulvihill et al. 1980). A more detailed discussion of turbidity impacts on covered salmonids is presented below. Most of this discussion is summarized from an exhaustive review of 40 years of research on the physiological and behavioral effects of turbidity and suspended solids on salmonids by Bash et al. (2001).

Most research on the physiological effects of turbidity has entailed laboratory studies. Stress response is a result of the combination of duration, frequency, and magnitude of exposure and other environmental factors. Stress responses vary between salmonid species and life history stages. Suspended sediments may irritate gills, especially if the sediment is abrasive and angular in shape. Several laboratory studies have shown gill trauma and increased coughing frequency with increased turbidity. Other studies have shown impairment of osmoregulation during smolting in association with increases in suspended sediment (Bash et al. 2001).

Much of the scientific literature evaluating the effects of turbidity on fish is discussed in relation to turbidity concentrations associated with dredging. Dredging is not a PA covered under this PBA, and temporary increases in turbidity associated with those PAs that are covered will be substantially lower than turbidity associated with dredging activities. Several studies indicate that suspended sediment concentrations occurring near dredging activities do not cause gill damage in salmonids. Servizi and Martens (1992) found that gill damage was absent in under-yearling coho salmon exposed to concentrations of suspended sediments lower than 3,143 milligrams per liter (mg/L). A negligible risk of gill tissue damage is also expected for adult and sub-adult salmonids exposed to turbidity generated by dredging activities. This assumption is based on the fact that salmonids in these life stages are generally more tolerant of elevated suspended sediment levels (Stober et al. 1981) and are generally able to avoid localized areas of elevated turbidity associated with construction activities.

Suspended sediments have been shown to cause stress in salmonids, but at concentrations higher than those typically measured during dredging. Under-yearling coho salmon exposed to suspended sediment concentrations above 2,000 mg/L were physiologically stressed, as indicated by elevated blood plasma cortisol levels (Redding et al. 1987). Although turbidity may cause stress to salmonid species, studies by Redding et al. (1987) found that relatively high suspended sediment loads (2,000 to 2,500 mg/L) did not appear to be severely stressful to yearling salmon.

Additional studies have supported the assertion that water clarity affects fish behavior. Avoidance responses and changes in territorial behavior, feeding patterns, and homing ability have been observed in association with increased turbidity levels (Sigler 1988). Avoidance responses of rainbow trout and Atlantic herring to suspended sediment have been observed at concentrations of 10 and 20 mg/L, respectively (Wildish and Power 1985). Juvenile chum salmon, a species considered more tolerant of suspended sediment (Nightingale and Simenstad 2001a), have also exhibited avoidance behavior in response to elevated turbidity levels (Salo et al. 1979). However, turbidity plumes that do not extend from bank to bank are not expected to have a significant impact on the behavior of migrating fish because they are able to avoid the areas of high turbidity (Nightingale and Simenstad 2001a).

Water clarity is important to fish during the development of visual acuity. Water clarity affects light transmission, which in turn is thought to play a role in the development of visual acuity in fish (Nightingale and Simenstad 2001a). Visual acuity adjustment in estuarine waters is part of the smolting process of salmonids (Beatty 1965; Folmar and Dickhoff 1981). Similar visual development has been reported in juveniles of other species, such as sand lance, kelp greenling, and lingcod (Britt 2001; Tribble 2000).

The behavioral effects of suspended sediments on salmonids are described by laboratory and field studies in the categories of avoidance and changes in territoriality, foraging, predation, homing, and migration. Salmonids appear to avoid areas of increased turbidity in laboratory and field studies. One study indicated that salmonids were displaced from waters with levels of turbidity higher than 70 Nephelometric Turbidity Units (NTU) (Bisson and Bilby 1982). Laboratory studies have shown alterations in social interactions and territoriality in response to increases in turbidity. Berg (1982) showed that territoriality among juvenile coho salmon ceased with a pulse of turbidity of 60 NTU and was re-established at turbidity below 20 NTU. It has been suggested that decreased territoriality and a breakdown in social structure can lead to secondary effects such as altered feeding and growth rates, which may in turn lead to increased mortality. Some laboratory studies have shown a negative impact from increased turbidity on foraging, possibly because of reduced visibility, while other studies have shown a positive effect on foraging, possibly because of reduced risk of predation.

Laboratory and field studies have shown a link between increased turbidity and reduced primary production and prey availability. Field studies have indicated that increased turbidity may also delay migration (Bash et al. 2001). Additionally, salmonid populations that are not accustomed to high levels of turbidity can be negatively affected by levels of turbidity as low as 18 to 70 NTU (Gregory 1992).

Although it is difficult to determine the exact degree to which a temporary increase in turbidity will result from the PAs, any suspension of sediments caused by a PA is expected to be short-term and not to result in chronic sediment delivery to adjacent waters. Specific BMPs and ABMPs will be implemented for each PA identified in Table 6-1 as having the potential to cause an increase in turbidity levels (Appendix C) to ensure that the potential for increased turbidity is avoided or minimized. Additionally, for all PAs implemented, Caltrans will be required to comply with current water quality regulations and other permit conditions. The PAs are not anticipated to increase concentrations of suspended sediments to a level that will result in any physiological effects (e.g., gill flaring, coughing, or increased blood sugar levels) or sedimentation.

In addition, in-water work will only occur during the allowable in-water work window when the covered species are least likely to be present, or when those life-history stages best suited to avoid or adequately manage the temporary increase in turbidity are present. Those fish that are present in the construction area when the effects are manifest are likely to avoid the area until the effects dissipate. Hence, short-term, localized increases in turbidity associated with the PAs will not likely result in any significant physiological effects on salmonids, their habitat, or their prey.

The PAs that may cause in increase in turbidity are described below, as well as the anticipated range of effect associated with each PA.

PA-1 involves the operation of construction equipment and vehicles that may be required to complete certain SSPs. The operation of construction equipment and vehicles can disturb soils, dirt, and dust adjacent to surface water and lead to erosion and conveyance of fine sediment to those surface waters, potentially causing a temporary increase in turbidity. The inclusion of ABMPs will avoid or minimize potential increases in turbidity in surface waters and potential

adverse effects on covered species from the operation of construction equipment and vehicles. This PA does not include the operation of construction equipment or vehicles in a stream channel (see PA-14) and is therefore not expected to result in any measurable increase in turbidity levels or effect on covered species.

PA-4 involves the cleaning of roadways of sediment and debris during and following maintenance and construction activities. This PA will decrease the potential for SSPs to result in increased turbidity within surface waters that support covered species, as sediment and debris that falls onto the roadway during maintenance and construction activities as well as during storm events will be removed from the roadway and will therefore not be conveyed by wind or runoff to surface waters.

PA-5 involves the temporary and permanent storage of sediment, debris, pavement, petroleum products, and other construction materials within a specific and designated site. The inclusion of BMPs and ABMPs as part of this PA will minimize and avoid the potential for this PA to result in an increase in turbidity in adjacent or nearby surface waters. Some temporary, minor increases may occur as a result of this PA; however, with the inclusion of the BMPs and ABMPs, any increase is expected to be unmeasurable.

PA-7 involves the discharge of water conveyed from construction areas (e.g., areas behind cofferdams, excavated holes around footings and other structures) and geotechnical drilling sites. This water is typically conveyed to sediment settling basins (PA-12) for treatment (PA-7), then typically discharged to an upland location and allowed either to infiltrate into the ground or to pass through a series of BMPs (e.g., weed-free hay bales) intended to remove sediment prior to discharge to a surface water. Based on the source of the water, the amount of water likely to be encountered, and the detention and/or treatment of water prior to discharge to any surface waters, this PA is anticipated to result in a relatively minor, short-term increase in turbidity that is expected to be discountable.

PA-8 involves the use of geotechnical drill rigs and lubricants. This activity will generally be a very minor action, affecting approximately 25 square feet or less. This PA will not occur within a wetted active channel, but may occur below the OHWL in dry streambeds and on gravel bars of active channels. Increases in turbidity will be relatively minor, causing potential short-term increases in turbidity that are expected to be discountable.

PA-10 involves the removal and disturbance of upland, riparian, and wetland vegetation. The extent of upland or riparian vegetation removed when this PA is implemented will vary depending upon the SSP and the specific location. However, the maximum extent of vegetation removed will range from 5,000 to 15,000 square feet (0.11 to 0.34 acre). This includes a mix of riparian, upland, and/or wetland vegetation. Areas where vegetation removal and disturbance occur will generally be replanted with native woody and herbaceous plants. The removal of riparian vegetation may result in temporary increases in turbidity associated with rain events that convey soil, dirt, and dust to surface waters. Increased turbidity associated with vegetation removal will be temporary and is expected to be discountable based on application of appropriate BMPs and ABMPs intended to minimize the transport of fine sediment and discharge to surface waters.

PA-11 involves establishing staging and storage areas. These areas are typically located in currently developed areas; or, if they must be created, they are established away from surface waters or other sensitive habitats. This PA is not expected to have any measurable effect on turbidity with the inclusion of BMPs and ABMPs. Permanent staging areas adjacent to surface waters will be located within the managed right-of-way and will be relatively small in size, and are not expected to result in any increase in turbidity.

PA-12 involves the construction of temporary sediment settling basins to provide the detention of sediment laden water, allowing sediments to settle out of the water column prior to discharge to surface waters. This PA is intended to avoid and minimize potential increases in turbidity associated with other Pas and SSPs. Thus, the implementation of this PA as part of an SSP will actually reduce the overall potential for an SSP to result in increased turbidity, thereby affecting fish or other aquatic organisms.

PA-13 involves the clearing and grading for temporary access roads and traffic detours. The area required for such features will be kept to the minimum necessary based on the equipment required to complete a specific SSP. Up to 1 acre of land could be affected, although in general the area affected will be significantly less, totaling perhaps a few thousand square feet. Because this PA involves implementation of BMPs and temporary impacts, no measurable long-term increases in turbidity are anticipated.

PA-14 involves the operation of construction equipment and vehicles in stream channels. This activity can involve the operation of a backhoe bucket arm to clean debris from a culvert or be as intrusive as large equipment crossing a channel and even operating from an active channel. If equipment operates from the channel the work area is generally isolated to minimize turbidity. The operation of construction equipment and vehicles in the stream channel will be localized and temporary and is not expected to increase turbidity to a level that could result in impacts beyond behavioral changes in fish, such as avoidance of the work area.

PA-15 involves the construction of temporary stream crossings. These features are temporary, affect between 200 and 1,000 square feet, and are constructed of larger quarry spalls (e.g., large gravel to cobble size) or other similar material rather than dirt, sand, or fine sediment. Temporary increases in turbidity may occur, and such increases could result in behavioral changes in covered species, such as avoidance of the work area.

PA-16 involves the removal and disturbance of aquatic vegetation, stream substrate, and LWD. This PA may affect between 300 and 22,000 square feet of channel/ditch. This PA generally involves the removal of fine sediment or other substrates from drainage channels or roadside drainage ditches to keep these features functioning properly and associated culverts open. LWD may be removed from channels to avoid hydraulic conditions that could damage or that are threatening Caltrans-managed infrastructure. Implementation of this PA may also remove aquatic vegetation from drainage ditches that may discharge to surface waters, as well as remove material that may be affecting conveyance of water within drainage channels/ditches or through culverts. Removal of LWD that creates erosive hydraulic conditions affecting Caltrans-managed infrastructure will also avoid erosion and sediment inputs to surface waters as well as a potential

catastrophic failure of slopes and road prisms. Overall, this PA may result in minor temporary increases in turbidity, and such increases could result in behavioral changes in covered species.

PA-17 involves the installation of temporary cofferdams and diversion cofferdams to isolate in-channel activities from the streamflow. The potential for this PA to increase turbidity depends upon several factors, including: the size of the stream; duration the cofferdam is in the channel; and the area ponded behind the dam (if the entire channel is dammed). Because this PA involves temporary cofferdams and will occur during the approved in-water work window it is not anticipated that it will result in any measureable impact on covered species from potential increases in turbidity. Additionally, cofferdams will be installed after implementation of PA-28 and the work area is essentially isolated from fish access; consequently, no measurable impact on fish or fish habitat is anticipated to occur as a result of this PA.

PA-18 involves temporarily redirecting streamflow. In general, this PA will affect less than 50 linear feet of stream channel, but can affect up to 300 linear feet of stream channel. The relatively minor amount of channel affected, minor channel disturbance, and the temporary nature of this PA are anticipated to have an unmeasurable impact on the covered species from potential increases in turbidity. Additionally, the flow will not be diverted until after PA-28 has been implemented and the channel from which water will be diverted is essentially isolated from fish access; consequently, no measurable impact on fish or fish habitat is anticipated to occur as a result of this PA.

PA -19 involves the temporary drafting of water from streams and other water bodies. It is not expected that this PA will have any measurable impact on turbidity because the amount of water drafted is generally small in relation to the water body the water is drafted from and the drafted water is not discharged directly back into a surface water, but generally infiltrates back into the ground (if used for fire control or dust control) or is discharged to drainage ditches, bioswales, and other Caltrans-managed stormwater treatment and detention facilities prior to discharging to a surface water. BMPs and ABMPs will be employed to avoid and minimize potential increases in turbidity.

PA-20 involves the installation of permanent and temporary RSP, sheet piles, and retaining walls. The primary purpose of this PA is to stabilize unstable side slopes and streambanks and reduce erosion or significant slope failure. While this PA may result in temporary increases in turbidity within surface waters, the inclusion of ABMPs will ensure that potential increases in turbidity are avoided and minimized. Additionally, implementation of this PA may avoid slumping and deposition of a significant quantity of material within a surface water, thereby avoiding a more catastrophic impact on fish or fish habitat.

PA-22 involves the removal of culverts, of which approximately 60% are removed from ephemeral streams during periods when the channels are dry. When culvert removal occurs in active channels the stream channel is isolated beginning with the removal and exclusion of fish from the work area (PA-28) and the installation of cofferdams (PA-17) and the work is done in-the-dry. Removed culverts are disposed of off site at an approved facility, as is any excess road ballast. Excavated materials that remain on site are covered to avoid erosion, conveyance, and deposition within surface waters. Increased turbidity is avoided and minimized through

incorporation of BMPs and ABMPs, and any increase is not expected to have a measurable effect on covered species. Additionally, the removal of culverts is completed once the fish removal and exclusion (PA-28) and temporary cofferdams have been installed (PA-17); consequently, the actual work area is isolated from flow. Once the cofferdams have been removed, the resulting increase in turbidity will be of short duration, but may cause fish to avoid the immediate in-water work area.

PA-23 involves the cleaning, retrofitting, or installation of culverts and, like PA-22, is not expected to increase turbidity to a point that will impact covered species beyond avoidance of the work area following re-watering of the work area.

PA-24 involves the installation of fishways or stream gradient control structures intended to improve or maintain fish passage at Caltrans-managed infrastructure (e.g., culverts). Most streams where this PA is implemented are less than 10 feet in width at the OHWL and the area affected is relatively small, generally less than 1,000 square feet. Increases in turbidity will be minimized through incorporation of BMPs and ABMPs and are not expected to reach a level that could result in injury to fish. Behavioral changes such as avoidance of the work area could potentially occur. Additionally, in-water work associated with this PA will commence after implementation of PA-28 and PA-17, as appropriate, when all fish have been removed from the work area and the work area has been isolated. The potential for increased turbidity will occur once the work area is re-watered; however, any increase will be temporary.

PA-25 and PA-26 involve the replacement of existing bridge structures, excluding impact pile-driving activities. Work generally occurs during the dry season, when streams and rivers are at low-flow conditions. This PA could affect between 100 and 10,000 square feet. The inclusion of BMPs and ABMPs will avoid and minimize potential increases in turbidity, and impacts from elevated turbidity are expected to be relatively minor, perhaps affecting the behavior of covered species, such as avoidance of the work area.

PA-27 involves the blasting of rock and other substrate and is not a commonly employed PA. It is generally employed for bridge and culvert replacement activities where the geologic conditions preclude other methods of grading and site preparation. The inclusion of BMPs and ABMPs will avoid and minimize potential increases in turbidity. Increases in turbidity associated with blasting may include changes in behavior, such as avoidance of the work area.

PA-29 involves the implementation of BMPs, which will ensure that all PAs for which BMPs exist and ABMPs have been established will avoid and minimize potential impacts on covered species. This PA is expected to decrease the potential for the covered activities to temporarily increase turbidity.

Performance Standard Benchmarks

The *Water Quality Control Plan for the North Coast Region* (North Coast Regional Water Quality Control Board 2007) implements discharge prohibitions related to construction and associated activities. These guidelines state that “waters shall be free of coloration that causes nuisance or adversely affects beneficial uses,” that “turbidity shall not be increased more than 20% above naturally occurring background levels,” and that “the suspended sediment load and

suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses" (North Coast Regional Water Quality Control Board 2007). Beneficial uses are defined to include the preservation and enhancement of fish, wildlife, and other aquatic resources (North Coast Regional Water Quality Control Board 2007).

The *San Francisco Bay Basin Water Quality Control Plan* (San Francisco Bay Regional Water Quality Control Board 2007) also outlines water quality objectives and discharge prohibitions. In surface waters, the plan states that "waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses" (San Francisco Bay Regional Water Quality Control Board 2007). More specifically, the plan restricts increases in turbidity from waste discharge to be no greater than 10% of the natural turbidity in areas where the natural turbidity is greater than 50 NTU (San Francisco Bay Regional Water Quality Control Board 2007).

Caltrans will adhere to these provisions during implementation of all CAs through implementation of appropriate BMPs and ABMPs.

Summary

The risk of take of covered fish species increases in proportion to the magnitude and duration of the impact; vulnerability of the affected life-history stage; inability of the fish to avoid the impact through avoidance behavior; physiological, developmental, and behavioral impairments suffered by the fish; and indirect mechanisms such as exposure to predation. However, the likelihood of take occurring with the previously-described avoidance and minimization measures in place is extremely low because of the relatively short duration of turbidity increases anticipated and the timing of activities that could result in increased turbidity (i.e., during the allowable in-water work windows). Additionally, those PAs associated with in-water work will be implemented in conjunction with PA-28 to isolate the work area and avoid physically affecting covered fish species. The re-watering of an isolated work area may provide the greatest potential for a PA that requires in-water work to have a measurable impact on covered fish species, and that impact is expected to be limited to the avoidance of the work area.

Benefits of SSPs

The covered species may benefit from implementation of certain PAs such as installation of slope protection devices (SPDs) that prevent catastrophic slope failure and subsequent discharge of debris and fine sediment into surface waters containing those species. Additionally, PAs implemented as part of the maintenance, repair, or replacement of culverts, bridges, or grade control structures, which will reduce the potential for bank erosion and channel scour as well as improving fish passage, will benefit covered species by preventing or minimizing suspension of sediments and associated increases in turbidity.

Impact Thresholds

Increased turbidity could be caused by the PAs identified above. Although specific BMPs and ABMPs associated with each PA (Appendix C) will be implemented to avoid or minimize increased turbidity, some covered species could still be affected. Below are the general conditions under which impacts on covered species could potentially occur due to implementation of the previously mentioned PAs and the general thresholds of effects, or "bins" (actual effect determinations are presented in Chapter 7).

No Effect:

- PAs that could increase turbidity occur within waters that do not contain covered species or their designated or proposed critical habitat and potential increases in turbidity are not transmitted downstream to waters that do contain covered species or designated critical habitat.
- Elevated turbidity occurs during a time of the year when no covered species occur within the action area and the elevated turbidity does not affect designated or proposed critical habitat.
- PAs occur in dry channels that either 1) do not contain covered species during any time of the year or, 2) do not contain covered species during periods when the "first flush" (i.e., first seasonal channel inundation) generally occurs, when sediments disturbed during construction will be suspended within the water column.

May Affect, Not Likely to Adversely Affect:

- Elevated turbidity occurs within waters that contain covered species or designated critical habitat or is transmitted downstream to waters that contain covered species or designated critical habitat.
- Elevated turbidity may reach a level that could change the behavior of a covered species (i.e., avoidance of the work area).

Chemical Contamination

Source of Impact and PAs Involved

Potential chemical contamination of surface waters in the coverage area could occur from contact with petroleum products, conveyance of petroleum products, and contact with uncured concrete or geotechnical drilling lubricants.

The following PAs could result in the contamination of surface waters to levels that could potentially affect covered species:

- PA-6
- PA-8
- PA-9
- PA-14
- PA-21

The level of risk to covered species depends on the type and amount of contaminant and the time of year the exposure occurs relative to the occurrence and life history stage of covered species.

Range of Effects

The range of effects resulting from chemical contamination varies depending on the source and location of the impact. The most likely sources of contamination are exposure to petroleum products, exposure to uncured concrete, or a fracout or spill of drilling muds to surface waters. The following PAs could result in potential chemical contamination of surface waters.

PA-6 involves the application of petroleum products, concrete, and other materials to road surfaces or related infrastructure for repair or to maintain their function. These materials are applied in-the-dry and allowed to cure, thereby limiting the potential for

leaching/conveyance/discharge of contaminated materials to surface waters. The inclusion of appropriate BMPs and ABMPs will ensure potential impacts associated with this PA are avoided and minimized.

PA-7 involves the discharge of water conveyed from construction areas (e.g., areas behind cofferdams, excavated holes around footings and other structures) and geotechnical drilling sites. This water is typically conveyed to sediment settling basins (PA-12) for treatment (PA-7), then typically discharged to an upland location and allowed either to infiltrate into the ground or to pass through a series of BMPs (e.g., weed-free hay bales) intended to remove sediment prior to discharge to a surface water. Based on the source of the water, the amount of water likely to be encountered, and the discharge of the water to upland locations prior to discharge to any surface waters, this PA is expected to avoid or minimize potential chemical contamination that could potentially be discharged to surface waters.

PA-8 involves the use of geotechnical drill rigs and lubricants. This activity will generally be a very minor action, affecting approximately 25 square feet or less. This PA will not occur within a wetted active channel, but may occur below the OHWL in dry streambeds and on gravel bars of active channels. This PA does not cover the discharge of geotechnical drilling lubricants to surface waters, thereby avoiding potential impacts on surface waters from chemical contamination associated with such lubricants.

PA-9 involves the application of paint, water, sealant, and caulk. These materials are typically applied in-the-dry and allowed to cure to avoid potential leaching/conveyance/discharge of these materials to surface waters, thereby avoiding or minimizing potential chemical contamination to such waters.

PA-14 involves the operation of construction equipment and vehicles in stream channels. This activity can involve the operation of a backhoe bucket arm to clean debris from a culvert or be as intrusive as large equipment crossing a channel and even operating from an active channel. If equipment operates from the channel the work area is generally isolated to minimize direct contact with surface waters. The operation of construction equipment and vehicles in the stream channel will be conducted in dry stream beds or within cofferdams; consequently, such operation is not expected to result in any chemical contamination of surface waters.

PA-21 involves the placement of concrete and concrete slurry seal coat in cofferdams, footings, and bridge forms. These materials are allowed to cure before exposure to surface waters, thereby avoiding potential chemical contamination of surface waters associated with exposure to wet concrete.

Exposure to Petroleum Products and Other Chemicals

Petroleum-based products contain polycyclic aromatic hydrocarbons (PAHs), which can cause acute toxicity to salmonids at high levels of exposure, and can also cause chronic lethal and acute and chronic sublethal effects on aquatic organisms (Neff 1985). Construction machinery will at times operate below the OHWL or MHHW line. No machinery will enter the water, except for a bucket, or operate directly within waters except to place or remove materials via excavator arm extension or other similar device. Although no machinery will operate directly within waters,

there is a risk that petroleum products (e.g., fuel, oil, hydraulic fluid) may leak into the water or a temporarily isolated portion of the active channel. The risk to covered species depends on the type of contaminant that may be accidentally leaked, the time of year, and the amount of material leaked, as well as the success of measures to clean up the material.

Other petroleum products or chemicals will be used when certain PAs are implemented that involve maintenance or repair of existing roadway surfaces. The potential for the petroleum products and chemical materials used for these maintenance and repair activities to enter or be conveyed to surface waters during rain events is minimal because of the time of year these activities occur and the BMPs and ABMPs associated with these PAs. These measures are intended to avoid or minimize the potential for contact with or conveyance of potentially harmful substances and materials to surface waters.

Uncured Concrete

The use or placement of wet concrete in and adjacent to surface waters may result in a short-term, localized increase in pH levels if the surface waters are exposed to the uncured, wet concrete. If uncured concrete comes into contact with surface waters, alkaline substances in the concrete can leach into the water. These substances can potentially increase hydrogen ion concentration (pH) in water, making it more acidic. Rapid changes in the pH and increases in the acidity of the water can adversely affect fish, particularly if the pH concentration is raised above 9.

The activities covered under this PBA may require the use of cast-in-place methods for installing concrete structures, such as bridge footings. Use of dry, cured concrete will be the preferred option; however, this is not always feasible. When cast-in-place methods are used, the concrete will be allowed to cure fully before being exposed to surface waters. It is expected that impacts associated with increased pH will be negligible and immeasurable because the PAs will implement appropriate BMPs and ABMPs and will be required to meet water quality standards.

The immersion of wet concrete in water can result in short-term, localized increases in pH level that can affect covered species. However, the CAs will use only sufficiently cured concrete during in-water projects or allow wet concrete to sufficiently cure before exposure to surface waters to avoid or minimize potential impacts on covered species.

Geotechnical Drilling Lubricants

Geotechnical drilling consists of drilling holes to varying depths using circular drill bits. Casings are driven to a depth that allows sealing. Inner casings are inserted together with drilling muds (bentonite clay or polymer) to a greater depth to obtain more samples. After drilling is completed and the inner casing and core samples are removed, the outer casings are flushed out until the water runs clear. Then the outer casings are removed. Geotechnical test holes are generally 4–6 inches in diameter.

Lubricants are necessary where drilling encounters rock. Lubricants may accidentally be spilled during drilling operations or afterward (e.g., during removal of casings) and could affect federally listed or proposed species and designated or proposed critical habitat.

The most common lubricants used are bentonite and inert clay. However, in some instances, polymers may be used or added to the bentonite. When drilling occurs below the OHWL, only bentonite or inert clays will be used. Additionally, drilling below the OHWL will occur almost exclusively in-the-dry, whether through the use of a cofferdam or during the dry period in ephemeral streams.

Performance Standard Benchmarks

Caltrans will implement the appropriate BMPs and ABMPs (Appendix C) and comply with all applicable federal, state, and local water quality standards and permit conditions during construction.

Summary

Covered species could potentially be affected through exposure to petroleum products and chemicals, uncured concrete, and geotechnical drilling lubricants. The potential for exposure to these substances will be avoided or minimized through implementation of the appropriate BMPs and ABMPs, and ensuring that work below the OHWL occurs in the dry, whether through the use of a cofferdam or when an ephemeral stream is dry.

Additionally, certain PAs are included in this PBA specifically as a means of further avoiding and minimizing potential impacts. Such PAs include PA-7 (treat and discharge water conveyed from the construction area), PA-12 (construct sediment-settling basins), and PA-17 (install temporary cofferdams and diversion cofferdams).

Benefits of SSPs

Implementation of SSPs that would require the PAs identified above will not improve water quality, per se. However, scheduled maintenance can ensure that PAs are implemented with care and can minimize the potential need for emergency action, which may be more likely to result in exposure to petroleum products, uncured concrete, and geotechnical drilling lubricants because in an emergency such actions may be more likely to occur outside the approved work windows when more fish or more sensitive life history stages may be present.

Impact Thresholds

Contamination of surface waters could occur from implementing the PAs identified above. Although specific BMPs and ABMPs associated with each of these PAs will be implemented to avoid or minimize the likelihood of exposure to petroleum products and chemical contamination, uncured concrete, and geotechnical drilling lubricants, some exposure is still feasible.

In general, potential impacts on covered species from exposure to contamination will be avoided with the implementation of all applicable BMPs and ABMPs. No impacts on covered species are expected if petroleum products and chemicals, concrete, and geotechnical drilling lubricants are kept from surface waters, used during dry periods (i.e., not during rain events) or are sufficiently far from surface waters that direct conveyance will not occur.

If in-water work or work below the OHWL does occur, there will be no impact on covered species if the surface waters do not support such species, or the PAs are conducted during dry periods in ephemeral waters. Additionally, if all equipment fueling and staging occurs 300 feet or more from surface waters and appropriate BMPs and ABMPs are implemented to ensure that

the equipment and materials stored are adequately contained within the staging area, it is unlikely that such activities will have any impact on covered species.

Below are the general conditions under which impacts on covered species could potentially occur due to implementation of the previously mentioned Pas.

No Effect:

- PAs that require the use of petroleum products, chemicals, uncured concrete, or geotechnical drilling lubricants will not result in any leaks, leaching, discharges, transmittals or conveyance to surface waters that do or could contain covered species or their designated or proposed critical habitat.

May Affect, Not Likely to Adversely Affect:

- PAs identified above occur in waters that do contain covered species or their designated or proposed critical habitat and may result in the discharge of petroleum products, chemicals, uncured concrete, or geotechnical drilling lubricants to these surface waters. Concentrations of these materials are anticipated to be relatively low, if they can be detected at all over background concentrations of chemical contaminants associated with roadway run-off. The appropriate BMPs and ABMPs will be employed to avoid and minimize potential impacts on covered species. An accidental spill of potentially hazardous materials cannot be predicted, and thus most determinations of effect will be No Effect, as every opportunity to ensure an accidental spill does not occur will be taken.
- Potential discharges could affect the behavior of a covered species (e.g.,avoidance of the work area), if PAs are implemented that could result in an accidental discharge of hazardous materials to surface waters.

Water Temperature Changes

Source of Impact and PAs Involved

Water temperature can be affected by any CAs that remove aquatic, riparian, or shoreline vegetation, or otherwise expose surface waters to increased solar radiation. Activities that alter flow, both in surface waters and groundwater, can also modify temperature regimes. Temperature increases depend on several factors, including (but not limited to) the amount and location of riparian vegetation removed; the time at which vegetation was removed and duration before replanted vegetation becomes established; and the volume of water diverted, held, or discharged. A total of 7 PAs presented in this PBA could potentially affect water temperatures, which in turn could potentially affect the covered species should those PAs be implemented in or adjacent to waters that contain such species or are implemented during periods when covered species are present. These PAs include:

- PA-7
- PA-10
- PA-11
- PA-13
- PA-17
- PA-18
- PA-19

Range of Effects

Water temperatures significantly affect the distribution, health, and survival of fish, especially salmonids. Because fish are ectothermic (cold-blooded), their survival depends on external water temperatures, and they will experience adverse health effects when exposed to temperatures outside their optimal range (U.S. Environmental Protection Agency 2003). Aquatic invertebrates, also cold-blooded, have similar temperature dependencies. Additionally, as stream temperatures rise, dissolved oxygen content decreases. The combination of elevated water temperatures and low dissolved oxygen content can have deleterious effects on fish and other aquatic organisms by inhibiting growth, altering metabolism, amplifying effects associated with toxic substances, and increasing susceptibility to disease and pathogens.

Riparian vegetation provides shade from solar radiation (Murphy and Meehan 1991). In general, the smaller the stream, the more closely water temperatures tend to track air temperature; exposure to the sun's energy (from a lack of riparian vegetation) causes an increase in water temperature, while streams without an insulating canopy of riparian vegetation may also lose heat more rapidly when the air temperature is colder. Therefore, removal of trees can affect the water temperature in streams both by affecting local air temperatures and by increasing incident radiation and heat loss (Quinn 2005; Bolton and Shelberg 2001; Poole and Berman 2001; Knutson and Naef 1997; Murphy and Meehan 1991). The influence of riparian vegetation on water temperature generally diminishes as the size of the stream increases because of the proportionally reduced area in which riparian vegetation can insulate against solar radiation and trap air next to the water surface (Knutson and Naef 1997; Quinn 2005; Poole and Berman 2001; Murphy and Meehan 1991).

Impacts on water temperatures can also occur when groundwater flows are modified (Poole and Berman 2001). Groundwater aquifers help buffer stream temperatures by holding water in the soil, where it is not exposed to radiation from sunlight and is insulated from more dramatic changes in air temperature, then slowly releasing it into nearby water bodies.

Activities that alter flow, both in surface waters and groundwater, can also modify temperature regimes. If water is removed from the stream channel and held, for example, in a sediment-settling basin, water in the basin could increase in temperature if exposed to solar radiation. If this water is then discharged directly back into the stream, it could result in a temporary, localized increase in water temperature. Additionally, if flow is altered to the extent that water levels become shallow, thermal buffering from groundwater can be lost and extreme shifts in temperatures can occur (Waters 1999). Removal of riparian, shoreline, and upland vegetation can also affect groundwater flow by reducing the moderating effect of the vegetation, in essence accelerating the movement of groundwater and decreasing the influence of groundwater on surface water temperatures.

The following PAs could potentially affect water temperature:

PA-7 involves the discharge of water conveyed from construction areas (e.g., areas behind cofferdams, excavated holes around footings and other structures) and geotechnical drilling sites. This water is typically conveyed to sediment settling basins (PA-12) for treatment (PA-7), then typically discharged to an upland location and allowed either to infiltrate into the ground or to

pass through a series of BMPs (e.g., weed-free hay bales) intended to remove sediment prior to discharge to a surface water. Based on the source of the water, the amount of water likely to be encountered, and the detention and/or treatment of water prior to discharge to any surface waters, this PA is expected to have an unmeasureable or discountable affect on the water temperature of surface waters.

PA-10 involves the removal and disturbance of upland, riparian, and wetland vegetation. The extent of upland or riparian vegetation removed when this PA is implemented will vary depending upon the SSP and the specific location. However, the maximum extent of vegetation removed will range from 5,000 to 15,000 square feet (0.11 to 0.34 acre). This includes a mix of riparian, upland, and/or wetland vegetation. Impacts on vegetation will be avoided and minimized to the extent feasible to complete each specific SSP. Depending upon the water body affected by this PA, the impact on water temperature is expected to be minor or discountable. Additionally, riparian areas disturbed by this PA will be replanted with native riparian vegetation; consequently, no long-term impacts are anticipated.

PA-11 involves establishing staging and storage areas. These areas are typically located in currently developed areas; or, if they must be created, they are established away from surface waters or other sensitive habitats. This PA is not expected to have any measurable effect on water temperatures. Permanent staging areas adjacent to surface waters will be located within the managed right-of-way, will be relatively small in size, and are not expected to have any measurable impact on water temperatures.

PA-13 involves the clearing and grading for temporary access roads and traffic detours. The area required for such features will be kept to the minimum necessary based on the equipment required to complete a specific SSP. Up to 1 acre of land could be affected, although in general the area affected will be significantly less, totaling perhaps a few thousand square feet. Additionally, because riparian areas disturbed by this PA will be replanted with native riparian vegetation, no long-term impacts are anticipated.

PA-17 involves the installation of temporary cofferdams and diversion cofferdams to isolate in-channel activities from the streamflow. The potential for this PA to modify stream temperatures depends upon several factors, including: the size of the stream; exposure to thermal radiation; duration cofferdam is in the channel; and the area ponded behind the dam (if the entire channel is dammed). Because this PA involves temporary cofferdams and will occur during the approved in-water work window, it is not anticipated that any measureable change in water temperature will occur.

PA-18 involves temporarily redirecting streamflow. In general, this PA will affect less than 50 linear feet of stream channel, but can affect up to 300 feet of channel. The relatively minor amount of channel affected and the temporary nature of this PA is not anticipated to result in any measurable changes in water temperature.

PA -19 involves the temporary drafting of water from streams and other water bodies. It is not expected that this PA will have any measurable impact on water temperature because the amount of water drafted is small in relation to the water body from which the water is drafted, and

because the drafted water is not discharged directly back into any water body, but generally infiltrates back into the ground (if used for dust control);, evaporates; or is discharged to ditches, bioswales, and other Caltrans-managed stormwater treatment and detention facilities prior to discharge to a surface water.

Performance Standard Benchmarks

Caltrans will implement the appropriate BMPs and ABMPs (Appendix C) and will comply with all applicable federal, state, and local regulations and permit conditions during construction.

Summary

Removing vegetation or altering flows to complete specific SSPs could potentially affect covered species by altering temperature regimes. However, the area of vegetation affected during maintenance activities would be relatively small, and any water temperature changes associated with that removal are not expected to be measurable. Flow alterations are generally temporary in nature and associated with diversion of water around work areas during active construction. Temporary flow diversions are not be expected to measurably affect water temperature either.

Benefits of SSPs

The SSPs are not anticipated to result in any benefits or improvements to water temperature with respect to the covered species. However, over the long term, the SSPs will maintain the existing temperature of surface waters affected by replanting vegetation removed during construction.

Impact Thresholds

The PAs identified above could result in localized , temporary modifications to water temperatures. BMPs and ABMPs will be implemented to avoid or minimize project impacts that could affect the temperature regime of surface waters in the project area. Impacts on covered species are not expected to occur because no significant changes in water temperatures will occur.

Below are the general conditions under which impacts on covered species could potentially occur due to implementation of the previously mentioned Pas.

No Effect:

- PAs occur adjacent to and affect only surface waters that do not support covered species and do not transmit potential changes in water temperature downstream to waters that do support covered species.

May Affect, Not Likely to Adversely Affect:

- PAs that occur adjacent to surface waters that do support covered species minimize the removal and disturbance of riparian vegetation, withdrawal of and discharge to surface waters, and the ponding of surface waters. While such actions could affect water temperatures of surface waters, the potential change in the water temperature is expected to be relatively minor and is not expected to cause fish to modify their behavior (e.g.,relocating to areas with more suitable water temperatures).

6.2.2 Habitat Modification

Sedimentation

Source of Impact and PAs Involved

Sedimentation can be caused by PAs that result in the discharge of material to surface waters or cause erosion (e.g., by disturbing streambed or streambanks, destabilizing streambanks or shorelines, or modifying channel hydraulics in such a way as to increase or change erosive forces or natural sediment transport). A total of 15 PAs presented in this PBA could result in habitat modification, which could in turn affect the covered species should those PAs be implemented in or adjacent to waters where covered species are present and/or their habitat occurs. These PAs include:

- PA-7
- PA-8
- PA-10
- PA-13
- PA-14
- PA-15
- PA-16
- PA-17
- PA-18
- PA-22
- PA-23
- PA-24
- PA-25
- PA-26
- PA-27

Range of Effects

Sedimentation can be caused by disturbance of the streambed from PAs such as channel dewatering, operation of equipment within the stream channel, temporary stream crossings, culvert removal, and culvert replacement. Sedimentation can also be increased when riparian or shoreline vegetation is removed from streambanks. The root structure of riparian and shoreline vegetation resists the erosive power of flowing water and thus retards bank cutting by streams, stabilizes streambanks and shorelines, maintains undercut banks along stream margins, and inhibits sediment from entering streams by dissipating the erosive energy of floodwaters, wind, and rain (Knutson and Naef 1997). Removal of riparian of shoreline vegetation exposes streambanks and shorelines to the erosive effects of wind, rain, and current and increases the input of fine sediments to the aquatic system (Waters 1995).

Sedimentation could also occur if there were an accidental release of drilling muds to surface waters. Drilling muds such as bentonite are composed of clays that are cohesive.

Sedimentation caused by human activity and natural erosion can affect fish and other aquatic organisms through modification of habitat, such as filling pools, filling interstitial spaces in substrate, changing invertebrate communities (food base for fish and other aquatic and terrestrial organisms**),** and reducing the interchange of surface and subsurface waters. Increases in fine sediments in low-velocity stream reaches could also cover suitable spawning gravel. Other potential effects on streams include increased width-to-depth ratios, channel braiding, increased incidence and severity of bank erosion, reduced pool volume and frequency, and increased subsurface flow. These types of changes can result in a reduction in the quality and quantity of spawning and rearing habitat (Meehan 1991).

Increased sedimentation can result in direct disturbance of benthic macroinvertebrates. Benthic macroinvertebrates are consumed by salmonids, including covered species, and may represent a substantial portion of their diet at various times of the year and life-history stages. The effect of macroinvertebrate loss on salmonids is generally temporary, unless disturbance to the channel

results in permanent loss or modification of habitat or species composition. Once PAs are completed, benthic macroinvertebrates can drift from unaffected areas upstream and insects can also fall into the stream channel from adjacent riparian areas. This can lead to rapid recolonization of an area temporarily disturbed by a PA. Reported rates of recolonization range from approximately 30 to 45 days (National Marine Fisheries Service 2003a).

The PAs are not expected to increase sedimentation to a level that will measurably modify habitat conditions at a watershed scale or reach scale, such as increasing width-to-depth ratios or channel braiding. The PAs may cause a localized increase in turbidity, but any increase in turbidity is not anticipated to reach a level that will result in sedimentation.

The following PAs have been identified as having the potential to increase turbidity, but are not anticipated to reach levels that could cause sedimentation.

PA-8 involves the use of geotechnical drill rigs and lubricants. This activity will generally be a very minor action, affecting approximately 25 square feet or less. This PA will not occur within a wetted active channel, but may occur below the OHWL in dry streambeds and on gravel bars of active channels. Any increases in turbidity will be localized and temporary and will not result in measurable sedimentation.

PA-10 involves the removal and disturbance of upland, riparian, and wetland vegetation. The extent of upland or riparian vegetation removed when this PA is implemented will vary depending upon the SSP and the specific location. However, the maximum extent of vegetation removed will range from 5,000 to 15,000 square feet (0.11 to 0.34 acre). All areas where vegetation is temporarily removed or disturbed will be replanted with native vegetation to avoid or minimize erosion and potential inputs of fine sediments to surface waters. Temporary, localized increases in turbidity may result from this PA, but not to a level that will cause measurable sedimentation.

PA-13 involves grading of temporary access roads and traffic detours, thereby causing soil disturbance. Between 200 and 30,000 square feet may be disturbed as a result of implementing this PA, depending upon the access or detour required to complete an SSP. Implementation of BMPs and ABMPs will ensure that disturbed soils are stabilized, and that erosion and conveyance of fine sediments to surface waters are avoided and minimized. Temporary localized increases in turbidity may occur, but will not result in measurable sedimentation.

PA-14 involves the operation of construction equipment and vehicles in stream channels. This activity can involve the operation of a backhoe bucket arm to clean debris from a culvert or be as intrusive as large equipment crossing a channel and even operating from an active channel. If equipment operates from the channel the work area is generally isolated to minimize turbidity. The operation of construction equipment and vehicles in the stream channel will be localized and temporary and appropriate BMPs and ABMPs will be employed to avoid and minimize increased turbidity; consequently, this PA is not expected to increase turbidity to a level that would result in measurable sedimentation.

PA-15 involves the construction of temporary stream crossings. These features are temporary, affect between 200 and 1,000 square feet, and are constructed of larger quarry spalls (e.g., large gravel to cobble size) or other similar material rather than dirt, sand, or fine sediment. Temporary increases in turbidity may occur, but not to a level that would result in measurable sedimentation.

PA-16 involves the removal and disturbance of aquatic vegetation, stream substrate, and LWD. This PA may affect between 300 and 22,000 square feet of channel/ditch. This PA generally involves the removal of fine sediment or other substrates from drainage channels or roadside drainage ditches to keep these features functioning properly and associated culverts open. LWD may be removed from channels to avoid hydraulic conditions that could damage or that are threatening Caltrans-managed infrastructure. Implementation of this PA will remove fine sediment from drainage ditches that may discharge to surface waters, as well as remove material that may be affecting conveyance of water through culverts. Removal of LWD that creates erosive hydraulic conditions affecting Caltrans-managed infrastructure will also avoid erosion and sediment inputs to surface waters as well as a potential catastrophic failure of slopes and road prisms, thus decreasing the potential for sedimentation.

PA-17 Involves the installation of temporary cofferdams and diversion cofferdams to isolate in-water activities from direct streamflow and to allow activities to be conducted in-the-dry. In general, cofferdams would affect between 100 and 2,000 square feet of stream channel. Once the isolated work area is exposed to flow again, increases in turbidity are likely to occur but not to levels that will result in measurable sedimentation.

PA-18 involves temporary redirection of streamflow around an isolated in-water work area. Temporary redirection of stream flow may affect between 50 and 300 linear feet of channel. Erosion at the outlet of the diversion will be avoided and minimized; consequently, sedimentation is not expected to occur to any measurable degree.

PA-22 involves the removal of culverts, of which approximately 60% are removed from ephemeral streams when the channels are dry. When culvert removal occurs in active channels, the stream channel is isolated and the work is done in-the-dry. Removed culverts are disposed of off-site at an approved location, as is any excess road ballast. Excavated material that remains on-site is covered to avoid erosion, conveyance, and deposition in surface waters. Increased turbidity is minimized through incorporation of BMPs and ABMPs and is not anticipated to cause increases that could result in sedimentation.

PA-23 involves the cleaning, retrofitting, or installation of culverts and, like PA-22, is expected to increase turbidity, but not to an extent that could result in measurable sedimentation. PA-24 involves the installation of fishways or stream gradient control structures, intended to improve or maintain fish passage at Caltrans-managed infrastructure (e.g., culverts). Most streams where this PA is implemented are less than 10 feet in width at the OHWL and the area affected is relatively small, generally less than 1,000 square feet. Increased turbidity will be minimized through incorporation of BMPs and ABMPs and is not expected to cause increases that would result in measurable sedimentation.

PA-25 and PA-26 involve the replacement of existing bridge structures, excluding impact pile driving. Work occurs during the dry season, when streams and rivers are at low-flow conditions, and affects between 100 and 1,000 square feet. Increases in turbidity may occur, but are not expected to result in measurable sedimentation.

Performance Standard Benchmarks

Caltrans will implement the appropriate BMPs and ABMPs (Appendix C) and comply with all applicable federal, state, and local regulations and permit conditions during construction to avoid and minimize erosion and sediment inputs into surface waters and potential sedimentation related impacts.

Summary

PAs could result in sediment inputs to surface waters, potentially resulting in localized sedimentation. The area potentially affected by sedimentation could vary dramatically depending on how much sediment is introduced to the surface water, the time over which that delivery occurs, the depth and velocity of the receiving water, and the character of the sediment (e.g., coarse to fine silt). However, implementation of BMPs and ABMPs intended to avoid or minimize sediment disturbance and transport, the small size of the areas generally disturbed during maintenance activities, and the short duration of these activities will minimize the potential for impacts on covered species.

Overall the PAs are not anticipated to cause sedimentation to a point that will be measurable, or modify habitat conditions (e.g., increase width-to-depth ratios, cause channel braiding, or embed suitable spawning substrate).

Benefits of SSPs

Listed species may benefit from the placement of slope protection devices if such devices prevent a catastrophic slope failure and subsequent input of fine sediment to surface waters. Covered species may also benefit from the installation of improved culverts, bridges, or gradient control structures that will reduce erosion. The implementation of BMPs and ABMPs will benefit listed species because these measures will result in the avoidance and minimization of impacts on covered species associated with sedimentation.

Impact Thresholds

Impacts on covered species could be caused by sedimentation if the PAs were to result in the discharge of significant amounts of sediment to surface waters or cause significant erosion to occur. The general thresholds at which impacts on listed species may result from sedimentation caused by the PAs is discussed below.

In general, sedimentation resulting from the PAs will be localized and is not expected to result in measurable impacts on covered species, assuming all applicable BMPs and ABMPs are implemented.

No Effect:

- PAs occur in or adjacent to water bodies that do not support covered species, and impacts (e.g., turbidity) will not be transmitted downstream to water bodies that do contain covered species or designated critical habitat.
- In ephemeral streams that do contain covered species, the PAs occur in-the-dry and do not result in modified habitat conditions post-project.

May Affect, Not Likely to Adversely Affect:

- PAs occur in or adjacent to water bodies that do support covered species or designated critical habitat, or impacts (e.g., turbidity) will be transmitted downstream to water bodies that do contain covered species.
- PAs occur in ephemeral or perennial streams and alter or modify habitat conditions within the channel to some extent (whether the modification is beneficial or negative).

Shoreline, Riparian, and Aquatic Vegetation Disturbance or Habitat Modification

Source of Impact and PAs Involved

Disturbance or modification to shoreline, riparian, and aquatic vegetation could occur as a result of implementation of certain PAs. Impacts on covered species could be caused by vegetation disturbance if the disturbance results in a modification of aquatic habitat conditions, results in reductions in potential prey species, or affects future habitat conditions through reductions in potential LWD recruitment. A total of 10 PAs presented in this PBA could result in disturbance or modification to shoreline, riparian, and aquatic vegetation, which in turn could affect the covered species should those PAs be implemented in or adjacent to waters where covered species are present. These PAs include:

- PA-10
- PA-13
- PA-15
- PA-16
- PA-22
- PA-23
- PA-24
- PA-25
- PA-26
- PA-27

Range of Effects

Shoreline and Riparian Vegetation

Shoreline and riparian zones form the transition zone between terrestrial and aquatic systems. Shoreline and riparian vegetation are an important component of freshwater, estuarine, and marine systems, providing shade, streambank, and shoreline stability; providing allochthonous inputs; and influencing groundwater conveyance and storage and the condition and complexity of aquatic habitats (Knutson and Naef 1997; Murphy and Meehan 1991). Removal or disturbance of shoreline or riparian vegetation resulting from implementation of PAs can result in impacts on covered species and their habitat by reducing shading, altering water temperature regimes, reducing streambank or shoreline stability, altering allochthonous input, altering groundwater influence and water quality, and altering habitat conditions.

Shoreline and riparian vegetation provides allochthonous inputs such as terrestrial macroinvertebrates, which supplement the diets of fish, and vegetation such as leaves and branches, which decompose and provide food sources for benthic macroinvertebrates and, in turn,fish (Knutson and Naef 1997; Murphy and Meehan 1991). Additionally, shoreline and riparian vegetation supplies LWD to the aquatic environment, which in turn influences channel morphology and habitat complexity, retains organic matter, and provides essential cover for fish (Quinn 2005; Naimen et al. 2002; Knutson and Naef 1997; Murphy and Meehan 1991). In lakes, estuaries, and marine environments, LWD also increases habitat complexity, affording cover for fish, protection from currents, and foraging opportunities (Quinn 2005). Removal of riparian vegetation can diminish allochthonous input into the aquatic environment, which can affect the prey base available to fish and forage detritus available for benthic macroinvertebrates, future LWD recruitment, and aquatic habitat complexity, thereby potentially diminishing the quality and complexity of habitat and species diversity of fish and benthic macroinvertebrates (Murphy and Meehan 1991).

Shoreline and riparian vegetation also acts as a filter for groundwater, filtering out sediments and taking up nutrients. Riparian vegetation, in conjunction with upland vegetation, also moderates streamflow by intercepting rainfall, contributing to water infiltration, and using water via evapotranspiration. Plant roots increase soil porosity, and vegetation helps to trap water flowing on the surface, thereby aiding in infiltration. Water stored in the soil is later released to streams through subsurface flows. Through these processes, riparian and upland vegetation help to moderate storm-related flows and reduce the magnitude of peak flows and frequency of flooding. Riparian vegetation, the litter layer, and silty soils absorb and store water during wet periods and release it slowly over a period of months, maintaining streamflows during rainless periods. (Knutson and Naef 1997)

Habitat conditions within freshwater, estuarine, and marine environments are influenced by shoreline and riparian vegetation. Inputs of LWD into these environments from riparian areas contribute significantly to habitat conditions within freshwater environments (Naiman et al. 2002). LWD input in streams is important in controlling channel morphology, regulating the storage and transport of sediment and particulate organic matter, and creating and maintaining fish habitat (Murphy and Meehan 1991). Fallen trees (particularly the branches and roots) provide complex habitat and refuge for fish and other aquatic species. Within streams, approximately 70% of structural diversity is derived from root wads, trees, and limbs that fall into the stream as a result of bank undercutting, mass slope movement, normal tree mortality, or windthrow (Knutson and Naef 1997).

In small streams, LWD is a major factor influencing pool formation in plane-bed and step-pool channels. Bilby (1984, in Naiman et al. 2002) and Sedell et al. (1985, in Naiman et al. 2002) found that approximately 80% of the pools in several small streams in southwest Washington and Idaho are associated with wood. Additionally, juvenile salmonid abundance in winter, particularly juvenile coho salmon, is correlated positively to abundance of LWD (Hicks et al. 1991). In larger streams, the position of LWD strongly influences the size and location of pools (Naiman et al. 2002). In larger streams, LWD is typically oriented downstream because of powerful streamflow, which favors formation of backwater pools along margins of the mainstem (Naiman et al. 2002).

In lakes, estuaries, and marine waters, LWD provides cover and foraging opportunities for fish. The removal of riparian and shoreline vegetation limits the future input of LWD to the aquatic environment and can limit habitat complexity, foraging opportunities, and predator avoidance (Quinn 2005).

Loss of shoreline and riparian vegetation as a result of implementing the PAs is expected to be minimal because the activities covered include only routine maintenance, repair, and replacement of existing structures and facilities. Also, access to most of these facilities is already established. If additional access is required, it will be minimized, per the BMPs and ABMPs outlined in Chapter 5 and Appendix C.

The PAs identified below could result in the removal or disturbance of shoreline and riparian vegetation, as well as aquatic vegetation (discussed below). Removal or disturbance is not expected to cause measurable habitat modifications at the watershed or reach scale. However, localized, temporary modifications to habitat will be measurable at the action area scale due to removal or disturbance of shoreline and riparian vegetation.

The following PAs have been identified as having the potential to remove or disturb shoreline and riparian vegetation; such removal or disturbance, if of sufficient extent, could result in measurable localized and temporary habitat modifications.

PA-10 involves the removal and disturbance of upland, riparian, and wetland vegetation. The extent of upland or riparian vegetation removed when this PA is implemented will vary depending upon the SSP and the specific location. However, the maximum extent of vegetation removed will range from 5,000 to 15,000 square feet (0.11 to 0.34 acre). All areas where vegetation is temporarily removed or disturbed will be replanted with native vegetation to avoid and minimize long-term habitat modifications. Habitat modifications that may result from implementation this PA include temporary reductions in shading, localized changes in water temperature, reduced allochthonous inputs, and localized reductions in LWD recruitment. The significance of these impacts on the covered species depends upon site-specific conditions; however, impacts are expected to remain below the threshold for injury.

PA-13 involves grading of temporary access roads and traffic detours, and thus vegetation removal and disturbance. Between 200 and 30,000 square feet may be affected as a result of implementing this PA, depending upon the access or detour required. Implementation of BMPs and ABMPs will ensure that the removal or disturbance of shoreline, riparian, and upland vegetation is removed and minimized. Temporary localized changes in habitat conditions associated with changes in shading, water temperature, allochthonous input, streambank stability, and so on are possible, but are not anticipated to result in measurable changes in habitat conditions at either the watershed or reach scale. Overall, impacts on covered species will not reach the threshold for injury.

PA-15 involves the construction of temporary stream crossings. These features are temporary and affect between 200 and 1,000 square feet of stream channel. Minor vegetation clearing at stream edges may be required to construct these features; however, clearing will be limited to minimize impacts and vegetation removed or disturbed will be replaced with native vegetation.

Consequently, impacts will be temporary and localized and are not expected to result in measurable effects on covered species.

PA-16 involves the removal and disturbance of aquatic vegetation, stream sediment and large woody debris. This PA may affect between 300 and 22,000 square feet of channel/ditch. This activity generally involves the removal of aquatic vegetation from streams and drainage ditches or channels to maintain unobstructed flow and conveyance to decrease flooding. Additionally, aquatic vegetation removal may be required to keep certain features, such as culverts, functioning properly. This PA will likely result in a beneficial effect on covered fish species, as the removal of nonnative aquatic vegetation will improve habitat conditions though improved migration corridors and open water habitats.

PA-22 involves the removal of culverts, of which approximately 60% are removed from ephemeral streams when the channels are dry. PA-23 involves the cleaning, retrofitting, and installation of culverts. When culvert replacement occurs in active channels the stream channel is isolated, water flow is diverted around the work area, and the work is done in-the-dry. Vegetation established on the road prism will be removed during culvert replacement activities. No vegetation removal or disturbance is anticipated from culvert cleaning. Culvert retrofitting may result in vegetation disturbance or removal. Any vegetation removed as part of this PA will be replaced with native vegetation, except trees removed from the road prism. Temporary, localized changes in habitat conditions from the removal of vegetation associated with this PA are anticipated to be unmeasurable based on the limited area of impact (primarily managed road prism).

PA-24 involves the installation of fishways or stream gradient control structures, intended to improve or maintain fish passage at Caltrans-managed infrastructure (e.g., culverts). Most streams where this PA is implemented are less than 10 feet in width at the OHWL and the area affected is relatively small, generally less than 1,000 square feet. Changes in habitat conditions will be localized and temporary, as all areas temporarily affected will be replanted with native vegetation. Impacts are not anticipated to be measurable.

PA-25 and PA-26 involve the replacement of existing bridge structures, excluding impact pile driving. Work occurs during the dry season, when streams and rivers are at low-flow conditions, and affects between 100 and 1,000 square feet. Changes in habitat conditions will be localized and temporary, as all areas temporarily affected will be replanted with native vegetation. Impacts are not anticipated to be measurable.

Freshwater Aquatic Vegetation

Certain PAs could have an impact on important aquatic vegetation by temporarily modifying ambient light and flow conditions, disturbing habitat, and directly removing aquatic vegetation.

Light availability is a fundamental requirement for plant growth. The light requirements of different plant species vary, but reduced light in the littoral zone of freshwater environments can potentially limit aquatic vegetation (Chambers et al. 1999). Light limitations can lead to a local reduction in autochthonous primary production (i.e., organic matter produced by aquatic plants within a river or stream) and a reduction in the other functions of aquatic vegetation, including cover, substrate for invertebrate species, and food for herbivores (Hruby et al. 1999). Although

no new permanent structures (bridges or culverts) would be constructed as part of the routine maintenance covered under this PBA, some temporary structures (e.g., temporary stream crossings) could shade or directly disturb/remove aquatic vegetation.

The PAs could result in a reduction of submerged and floating leaved vegetation, as well as benthic invertebrates. The disturbance of streambed sediments could cause the temporary loss of plants within the area disturbed. Dewatered channels may also experience loss of aquatic vegetation, depending on the duration of dewatering and vulnerability of the affected plants to desiccation and drought stress. Changes in flow associated with modifications to in-stream structures or habitat conditions could affect aquatic vegetation downstream of the structure. Additionally, the direct removal of aquatic vegetation could have a temporal impact, because vegetation recolonizes the affected areas.

Freshwater aquatic vegetation includes submerged and emergent plants rooted below the OHWL of bodies of fresh water (rivers, streams, lakes, ponds, and open-water wetlands). Freshwater aquatic vegetation provides fish and wildlife habitat, and is important to the cycling of nutrients and materials that occurs in freshwater ecosystems (Petr 2000). Aquatic vegetation can modify habitat conditions by slowing water velocity, trapping sediments, reducing wave-induced bank erosion, and altering temperature and water quality (Chambers et al. 1999; Coops et al. 1996).

A review of the interactions of fish and macrophytes worldwide reiterated a number of beneficial functions that macrophytes provide that have direct or indirect benefits for fish, including covered species (Cowx and Welcomme 1998, in Petr 2000). The benefits include:

- water purification, both direct (e.g., by oxygenation and conversion of toxic ammonia to usable nitrates) and indirect (e.g., by plants providing a large surface area for microbes to do the same tasks);
- nutrient recycling, including nutrient removal during the growing season and return during senescence;
- physical link between water and air for many invertebrates (e.g., larvae and nymphs of caddis flies, mayflies, and chironomids), which are food for fish and have aquatic larval stages and aerial adults;
- refugia for zooplankton, which graze on phytoplankton and keep water clear;
- cover and food sources for a large variety of invertebrates, many of which are food for fish;
- cover for fish of varying value and type, depending on the age and species of fish, as well as type of vegetation;
- spawning areas and sites of oviposition for many fish species;
- food sources for herbivorous fish;
- effects on flow patterns, including accretion of sediments and deflection of flow, thus providing quiescent waters and faster shallows; and
- creation of discrete habitat.

Littoral Vegetation

PAs in estuarine or marine waters have the potential to affect littoral vegetation through reductions in ambient light, direct disturbance and displacement, and vessel interactions.

Eelgrass and macroalgae are recognized as important habitat for a wide variety of organisms. Impacts on littoral habitats and the species they support may occur through the loss of littoral vegetation, which includes eelgrass, macroalgae, and intertidal vascular plants (e.g., salt marsh plants) if construction activities shade areas of littorial vegetation. Eelgrass and macroalgae provide vertical structure in nearshore marine habitats and facilitate several important ecological functions. Eelgrass and macroalgae are very productive and support marine food webs through the plant biomass and detritus that they produce; they also provide shelter and influence the physical and chemical properties of the nearshore environment (Nightingale and Simenstad 2001b). Eelgrass provides substrate for colonies of epiphytic algae and many crustacean species that are prey items for juvenile salmon and other fish (Nightingale and Simenstad 2001b). The complex structure of eelgrass communities and their associated epifauna and epiflora are also thought to limit the success of predators that typically associate and feed in unvegetated communities (Heck and Orth 1980, in Nightingale and Simenstad 2001b; Heck and Thoman 1984). Given the strong association of important fish prey resources with eelgrass, reductions in eelgrass extent or vigor may also reduce prey resources for fish.

Eelgrass retards current velocity at the sediment-water interface, allowing fine particulates to settle (Phillips 1984). This action typically affects sediment dynamics and local sediment characteristics, favoring continued growth and survival of eelgrass (Phillips 1984). The vertical structure of kelp forests also affords dissipation of wave energy (Jackson 1984), which can offer shoreline protection for other sensitive shoreline habitats.

Both eelgrass and macroalgae provide substrate for herring spawning (Bargmann 1998). Herring is a key species in nutrient and energy dynamics, providing an important link between zooplankton and larger predators, including Chinook salmon, bull trout, and other salmonid species (Bargmann 1998).

The types of potential impacts from CAs (reductions in ambient light, direct disturbance, and displacement) are generally the same as those discussed for aquatic vegetation above.

Performance Standard Benchmarks

Caltrans will implement the appropriate BMPs and ABMPs (Appendix C) and comply with all applicable federal, state, and local regulations and permit conditions during construction.

Summary

Some of the PAs could affect shoreline, riparian, or aquatic vegetation. These effects could either be through physical disturbance or removal, or through temporary shading (e.g., a temporary construction bridge). Maintenance activities will typically only affect small areas of riparian or in-water habitat. The PAs will be implemented to complete only those SSPs that will repair or replace existing structures and facilities, and thus are not expected to have a significant or measureable impact on shoreline, riparian, or aquatic vegetation to a degree that may cause an adverse impact on any of the covered species.

Benefits of SSPs

For SSPs that temporarily affect shoreline and riparian vegetation, disturbed areas will be regraded to pre-project contours and replanted with native vegetation. At sites that are currently inhabited by non-native species, the post-project conditions may be an improvement once native shoreline and riparian species become established. Removal of aquatic vegetation will increase conveyance of water within ditches and channels and provide increased open water habitat for fish.

Impact Thresholds

Disturbance to shoreline, riparian, and aquatic vegetation will occur as a result of the CAs, Covered species could be affected by vegetation disturbance/removal if the disturbance/removal results in a modification of habitat conditions; however, any such modification is anticipated to be temporary in nature.

In general, habitat modifications resulting from the disturbance or removal of shoreline, riparian, or aquatic vegetation will not result in significant impacts on covered species, assuming all applicable BMPs and ABMPs are implemented.

No Effect:

- PAs occur in or adjacent to a water body that does not support covered species, and impacts (e.g., decreased shading, changes in water temperature, decreased allochthonous inputs) will not be transmitted downstream to a water body that does contain covered species or designated or proposed critical habitat.

May Affect, Not Likely to Adversely Affect:

- PAs occur in or adjacent to a water body that does support covered species or designated critical habitat, or potential impacts (e.g., decreased shading, changes in water temperature, decreased allochthonous input) may be transmitted downstream to a water body that does contain covered species or designated critical habitat.
- Implementation of PAs could result in a change in species behavior; a temporary, localized change in baseline conditions; or could affect prey resources the species is dependent upon. The potential for any of the PAs to affect a covered species or their designated critical habitat may be unlikely or discountable.

Upland Vegetation Disturbance or Habitat Modification

Source of Impact and PAs Involved

Certain PAs could result in disturbance to upland vegetation, which could potentially affect covered aquatic species. These PAs include the following:

- PA-10
- PA-13

Range of Effects

Stream channels are dynamic and linked strongly to habitat conditions in tributary channels and surrounding valley and hillslope and upland areas. Therefore, changes in the upper reaches or in upland portions of watersheds can lead to changes in stream power and the sediment transport

regime in the lower reaches of watersheds. For example, removal of upland vegetation and increases in impervious surface anywhere in a watershed associated with increased urbanization can lead to greater and more pronounced variability within the hydrologic conditions of the stream (Booth et al. 2002). One consequence of this change is increased peak flows and corresponding increases in erosion and sediment transport capacity, which often cause streambank instability and channel downcutting (Dunne and Leopold 1978). These are extreme examples of the impacts associated with disturbance or modification of upland vegetation. The PAs will not require the disturbance or modification of upland vegetation in quantities that such significant impacts might occur.

The PAs mentioned below could result in the removal or disturbance of upland vegetation. Removal or disturbance is not expected to cause measurable modifications to aquatic habitats at the watershed or reach scale. Minimal, if any, localized or temporary modifications to aquatic habitat could occur as a result of the removal or disturbance of upland vegetation associated with the PAs.

The following PAs have been identified as having the potential to affect upland vegetation.

PA-10 involves the removal and disturbance of upland, riparian, and wetland vegetation. The extent of upland or riparian vegetation removed when this PA is implemented will vary depending upon the SSP and the specific location. However, the maximum extent of vegetation removed will range from 5,000 to 15,000 square feet (0.11 to 0.34 acre). All areas where vegetation is temporarily removed or disturbed are replanted with native vegetation to minimize potential impacts. Modifications to aquatic habitat are not expected to occur as a result of disturbance or modification of upland vegetation from this PA. Disturbance or modification of upland vegetation may result in minor changes to runoff patterns, but any modification is expected to be minor and unmeasurable in aquatic systems. Consequently, the significance of the change on the covered species or their designated critical habitat is expected to be discountable.

PA-13 involves grading of temporary access roads and traffic detours, and thus vegetation removal and disturbance. Between 200 and 30,000 square feet may be affected as a result of implementing this PA, depending upon the temporary access or detour required. Implementation of BMPs and ABMPs will ensure that the disturbance or modification of upland vegetation is avoided and minimized. Temporary localized changes in aquatic habitat conditions are not expected as a result of disturbance or modification to upland vegetation. Potential impacts on covered species and their designated critical habitat from the implementation of this PA are expected to be unmeasurable.

Performance Standard Benchmarks

Caltrans will implement the appropriate BMPs and ABMPs (Appendix C) and comply with all applicable federal, state, and local regulations and permit conditions during construction.

Summary

Modification to upland vegetation as a result of implementing any of the PAs identified above is unlikely to result in any measurable effect on conditions in aquatic habitats where covered species occur.

Benefits of SSPs

For SSPs that temporarily affect upland vegetation, disturbed areas will be regraded to pre-project contours and replanted with native vegetation. At sites that are currently inhabited by non-native species, the post-project conditions may be an improvement once native upland species become established.

Impact Thresholds

The PAs could result in removal or disturbance to upland vegetation. BMPs and ABMPs will be implemented to avoid or minimize vegetation disturbance associated with the PAs. Listed aquatic species could be affected by vegetation disturbance if they occur in the vicinity of these PAs.

In general, habitat modifications resulting from the disturbance or removal of upland vegetation will not result in significant impacts on covered species, assuming all applicable BMPs and ABMPs are implemented.

No Effect:

- PAs disturb or modify upland vegetation adjacent to a water body that does not support covered species, and potential impacts (e.g.,changes in run-off patterns, changes in shading, etc.) associated with the removal of upland vegetation will not be transmitted downstream to a water body that does contain covered species.
- All the applicable BMPs and ABMPs are implemented to control erosion and sediment conveyance to surface waters will be implemented in watersheds that do not contain covered spezcies and impacts will not be transmitted downstream to water bodies that do contain covered species.

May Affect, Not Likely to Adversely Affect:

- PAs occur in or adjacent to a water body that does support covered species or designated critical habitat, or potential impacts (e.g.,changes in run-off patterns, changes in shading, etc.) may be transmitted downstream to a water body that does contain covered species or designated critical habitat.
- Implementation of PAs could result in a change to species behavior, or a temporary, localized change in baseline conditions. The potential for any of the PAs to affect a covered species or their designated critical habitat may be unlikely or discountable.

Alteration of Channel Morphology and Hydraulics

Source of Impact and PAs Involved

The PAs may result in alteration of channel morphology and hydraulics, which can in turn affect covered species. Flow can be directly modified through diversion, drafts, or releases of water. It can also be modified by replacement of structures located within surface waters and the resultant changes in channel morphology. Additionally, removal of riparian, shoreline, and upland vegetation can modify groundwater flow or the interchange of surface water and groundwater, which can affect stream hydrology and hydraulics. A total of 13 PAs presented in this PBA could result in alteration of channel morphology and hydraulics, which in turn could affect the covered

species should those PAs be implemented in or adjacent to waters that contain covered species and are implemented during periods when such species are present. These PAs include:

- PA-7
- PA-10
- PA-14
- PA-15
- PA-16
- PA-17
- PA-18
- PA-19
- PA-20
- PA-21
- PA-23
- PA-24
- PA-25
- PA-26

Range of Effects

Streams are dynamic systems that adjust to maintain equilibrium between the erosive forces of flow and sediment transport and the resisting forces of bed and bank stability and their resistance to flow (Soar and Thorne 2001). Placement of structures within or beneath the stream channel can straighten the channel, reduce its width and its ability to migrate over time, and replace natural bed or bank structure and material with non-erodible, artificial materials (Brookes 1988, in Bolton and Shelberg 2001). These impacts can alter stream power, which is determined by water surface slope, flow volume, and channel roughness (Dunne and Leopold 1978). Channel roughness elements affect stream velocity by increasing resistance to flow (Leopold et al. 1964). Barks and Funkhouser (2002) identified some of the principal channel border roughness elements as artificial structures such as riprap, gratings, pilings, and bridge abutments, and natural structures such as LWD, vegetation, and sediment.

Changing the wetted perimeter of a stream can alter flow velocity and stream power (Leopold et al. 1964). Structures in the channel alter the wetted perimeter directly, such as when flow is confined within a culvert or between abutments, or indirectly, such as when erosion or deposition causes changes in channel geometry. Some bridges and improperly installed culverts that confine the channel can cause localized scour and erosion in the vicinity of the structure and increased sediment deposition immediately upstream (Sturm 2004).

Changes in sediment regimes caused by the placement of in-stream structures vary according to stream gradient and bed material. Generally, changes in sediment supply can cause loss of pools through filling, creation of scour pools, or a general coarsening or fining of bed materials. Impacts on streams with higher gradients tend to be less severe because they have a higher sediment transport capacity. Some water-crossing structures can also impair LWD transport in the stream channel, which can lead to reduced LWD accumulation in downstream reaches.

Because they confine the channel within a pipe, culverts can have some specific impacts on channel hydraulics. The principal impacts are identified by Bates (2003):

- channel realignment that eliminates natural features such as meanders, spawning riffles, and other diversity in the channel;
- shortened channels that carry flows at higher velocity, causing streambed instability and downstream scour and bank erosion;
- sediment mobilization that can smother redds and benthic invertebrates downstream;

- changes in stream base level that can destabilize the channel and cause reduced hydrology in floodplain water bodies;
- upstream bed and bank instability if the culvert is undersized, which causes the repeated formation and draining of an upstream backwater pool; and
- blocking the downstream movement of coarse sediment such as boulders and pieces of LWD.

In-stream structures can also isolate a channel from its floodplain and the important structural and functional elements of floodplains and channel migration zones. For example, complex channels can migrate throughout the floodplain in response to environmental changes, including floods, changes in sediment supply, and delivery of LWD to the stream. Bridges and culverts "lock" the channel by fixing it within artificial bounds set by the culvert walls, bridge abutments, and approach fills located on the floodplain. Also, closed culverts can lock the channel in the vertical dimension by imposing a fixed base level. This locking prevents the channel from adjusting to flow and sediment supply variability by altering its cross section and gradient; consequently, adjustment occurs by altering channel hydraulics, potentially destabilizing the channel. This effect is most pronounced in the immediate vicinity of the locking structure and results in relatively frequent disturbance of in-channel habitat in the affected area.

Dewatering can temporarily alter the flow regime in the affected surface waters. Flow must be diverted around the construction area and discharged downstream. Generally, cofferdams are installed upstream and downstream of the construction area to isolate a segment of stream and allow for dewatering of the work area. This approach allows the work area to be completely dewatered so that work can be performed in the dry stream channel**.** The alteration of flow associated with the dewatering of a work area depends on the size of the area dewatered, but generally is only temporary and limited to a relatively small area.

Species can potentially be affected by decreased base flows or increased peak flows, sedimentation in the vicinity of structures, decreased LWD mobilization and transport, destabilization of the channel in the vicinity of the structure, loss of important habitat features provided by meanders, and modification of associated floodplain through the straightening and locking of the channel. Impacts on species from sedimentation, turbidity, and LWD loss are covered in the applicable sections of this chapter.

The PAs mentioned above may result in the alteration of channel morphology and hydraulics. However, many of the potential impacts are expected to be beneficial, as the activities covered in this PBA include those intended to improve conditions (e.g.,cleaning of culverts).

The following PAs have been identified as having the potential to alter channel morphology and hydraulics.

PA-7 will involve the discharge of water conveyed from construction areas, such as from areas behind cofferdams and from excavated holes around footings and other structures, as well as geotechnical drilling sites. This water is typically conveyed to sediment settling basins for treatment, then discharged to an upland location and allowed to either infiltrate into the ground or through a series of BMPs intended to remove sediment (i.e. weed free hay bales). Based on

the quantity of water likely to be conveyed from construction areas, the source of the water, and the discharge of the water to upland locations prior to discharge to any surface waters, this PA is expected to have an unmeasurable or discountable affect on channel morphology or hydraulics.

PA-10 involves the removal and disturbance of upland, riparian and wetland vegetation. Up to 15,000 square feet of vegetation may be removed and/or disturbed by this PA, however generally less than 5,000 square feet of vegetation are affected. All areas where vegetation is temporarily removed or disturbed are replanted with native vegetation to avoid or minimize habitat modifications. Alterations to channel morphology or hydraulics are not expected to result from removal of upland vegetation that will result from implementation of this PA. Removal of riparian vegetation may cause minor changes in runoff patterns to adjacent streams, but any modification is expected to be minor and unmeasurable in aquatic systems. Thus the significance of the change on the covered species is expected to be discountable.

PA-14 involves the operation of construction equipment and vehicles in stream channels. This activity can involve the operation of a backhoe bucket arm to clean debris from a culvert or can be as intrusive as crossing a channel and even operating within an active channel. If equipment operates from the channel the work area is generally isolated to minimize increases in turbidity. The operation of construction equipment and vehicles in the stream channel will be localized and temporary and is not expected to significantly alter channel morphology or hydraulics and the impact to covered species or their designated critical habitat is expected to be discountable.

PA-15 involves the construction of temporary stream crossings. These features are temporary and impact between 200 square feet and 1,000 square feet of stream channel. Material used to construct the stream crossings will be similar in size and composition as the natural stream material, as appropriate (e.g.,sand or mud will not be used). Impacts on channel morphology and hydraulics will be temporary, and no long-term measurable affects are anticipated and the impact to covered species or their designated critical habitat is expected to be discountable.

PA-16 involves the removal and disturbance of aquatic vegetation, stream sediment and large woody debris. This PA may affect between 300 square feet and 22,000 square feet of channel/ditch. This activity generally involves the removal of fine sediment or other substrates from a channel or roadside drainage ditches to keep these features functioning properly and culverts open. LWD may be removed from channels to avoid damaging hydraulics that could threaten Caltrans managed infrastructure. Implementation of this PA will remove fine sediment from drainage ditches that may discharge run-off to surface waters, as well as remove material that may be affecting conveyance of water through culverts. Removal of LWD creating erosive hydraulics affecting Caltrans managed infrastructure will also avoid erosion and sediment inputs to surface waters as well as potential catastrophic failure of slopes and road prisms. This PA is not expected to negatively affect channel morphology or hydraulics, although the removal of LWD will affect habitat conditions at a localized scale, such as overhead and in-water cover and pool forming processes.

PA-17 Involves the installation of temporary cofferdams and diversion cofferdams to isolate in-water activities from direct streamflow and allow activities to occur in-the-dry. In general cofferdams affect between 100 and 2,000 square feet of stream channel. Changes to channel

morphology and hydraulics resulting from this PA will be temporary in nature and not expected to negatively impact channel morphology or hydraulics, and the potential impact so covered species and their designated critical habitat is expected to be discountable.

PA-18 involves temporary redirections of streamflow around an isolated in-water work area. Temporary redirections may affect between 50 and 300 linear feet of channel. Erosion at the outlet of the diversion will be avoided and minimized, thus changes to channel morphology and hydraulics will be temporary. This PA will be implemented during the approved in-water work window, to avoid and minimize potential impacts on covered species and their designated critical habitat.

PA -19 involves the temporary drafting of water from streams and other water bodies. It is not expected that this PA will have any measurable impact to existing channel morphology or hydraulics because the amount of water drafted is small in relation to the water body the water is drafted from and the drafted water is not discharged directly back into any water body, but generally infiltrates back into the ground (if used for fire control or dust control) or will be discharged to ditches, bioswales and other Caltrans managed stormwater treatment and detention facilities prior to discharge to a surface water.

PA-20 involves the installation of permanent and temporary rock slope protection (RSP), sheet piles, and retaining walls, which, when placed below the OHWL, will be a change to the channel morphology of a stream and could result in the modification of hydraulic energy within the stream channel, resulting in further localized changes in channel morphology. Implementation of appropriate ABMPs will ensure that potential changes to channel morphology and hydraulic energy are avoided and minimized.

PA-22 involves the removal of culverts, of which approximately 60% are removed from ephemeral streams when the channels are dry. PA-23 involves the cleaning, retrofitting and installation of culverts. When culvert replacement occurs in active channels the stream channel is isolated, water flow is diverted around the work area and the work is done in-the-dry. Appropriate BMPs and ABMPs are implemented to ensure such diversions avoid or minimize alterations to channel morphology and hydraulics. Retrofitting existing culverts could result in increased hydraulic forces (e.g.,increased pressure/energy) being exerted on channels and streambanks, resulting in changes to channel morphology. This condition would generally result if an existing undersized culvert was retrofitted. However only culverts that are appropriately sized, and do not negatively affect channel morphology are retrofitted. Temporary, localized changes in channel morphology and hydraulics may occur from removal, replacement, cleaning and retrofitting of culverts. The impacts are anticipated to be beneficial overall, as undersized culverts are removed and replaced with appropriate sized culverts, debris is removed from culvert inlets, and culverts are retrofitted to provide improved fish passage through a culvert.

PA-24 involves the installation of fishways or stream gradient control structures, intended to improve or maintain fish passage at or near Caltrans managed infrastructure (e.g.,culverts). Most streams where this PA is implemented are less than 10 feet in width at the OHWL and the area impacted is relatively small, generally affecting less than 1,000 square feet. Potential negative impacts from alterations of channel geometry and hydraulics associated with this PA will be

avoided or minimized during the design phase though hydraulic and hydrologic modeling of the design is performed to ensure the structure will have the intended results.

PA-25 and PA-26 involve the replacement (e.g.,removal and installation, respectively) of existing bridge structures, excluding impact pile driving. Work occurs during the dry season, when stream and river channels are dry or at low-flow conditions. The area affected is between 100 and 1,000 square feet. Alterations of channel morphology and hydraulics are generally minor, since structures are replaced, or beneficial, if structures are replaced in a manner that returns a more natural condition to the channel (e.g.,support columns set-back from the active channel or above the OHWL).

Performance Standard Benchmarks

Caltrans will implement the appropriate BMPs and ABMPs (Appendix C) and comply with all applicable federal, state, and local regulations and permit conditions during construction.

Summary

The alteration of flow associated with the dewatering of a work area depends on the size of the area dewatered, but generally is only temporary and limited to a relatively small area for maintenance activities covered in this PBA.

The SSPs do not include the installation or construction of new structures in-water (e.g., bridges or culverts), only the replacement of existing structures. The SSPs only include the repair or replacement of existing structures, and thus are not expected to negatively affect existing conditions. However, replacement of an undersized structure or a structure that is not functioning properly with an appropriate structure may modify the existing flow conditions or localized hydraulics in a beneficial manner. It is expected that such changes will be improvements over existing conditions at the watershed scale, and that all changes will be designed and intended to improve conditions (e.g., fish passage).

Benefits of SSPs

Impacts on channel morphology and hydraulics are anticipated to be beneficial for covered species in most instances. Covered species may benefit from the cleaning, repair, or replacement of culverts and bridges, as well as from installation of gradient control structures that may reduce erosion or deposition of sediments or provide improved fish passage.

Impact Thresholds

The PAs identified above could result in changes to channel morphology and hydraulics. BMPs and ABMPs will be implemented to avoid or minimize impacts on channel morphology and hydraulics. Covered species could potentially be affected by such changes.

In general, PAs that may result in changes in channel morphology or hydraulics, either temporarily or more long-term, will not result in significant negative impacts on covered species or their designated critical habitat, assuming all applicable BMPs and ABMPs are implemented. However, some PAs may result in long-term beneficial impacts on covered species and designated critical habitat.

No Effect:

- PAs that alter channel morphology and/or hydraulics only affect water bodies that do not support covered species or their designated critical habitat, and potential changes in channel morphology or hydraulics will not be transmitted downstream to water bodies that do support covered species or their designated critical habitat.

May Affect, Not Likely to Adversely Affect:

- PAs that alter channel morphology and/or hydraulics affect water bodies that do support covered species or their designated critical habitat, or alterations in channel morphology or hydraulics may be transmitted downstream to water bodies that do support covered species or their designated critical habitat.
- PAs have a beneficial affect on channel morphology and/or hydraulics (e.g., improved habitat conditions, fish passage, reduce channel erosions/scour) in water bodies that support covered species or are designated as critical habitat.
- Implementation of PAs could result in a change to species behavior, or a temporary, localized change in baseline conditions. The potential for any of the PAs to affect a covered species or the designated critical habitat may be unlikely or discountable.

6.2.3 Auditory and Visual Disturbance

Source of Impact and PAs Involved

Disturbance could be caused by SSPs that generate construction noise or utilize nighttime lighting.

A total of 28 PAs presented in this PBA could result in auditory and/or visual disturbance to covered species. These PAs include:

- PA-1
- PA-2
- PA-4
- PA-5
- PA-6
- PA-7
- PA-8
- PA-9
- PA-10
- PA-11
- PA-12
- PA-13
- PA-14
- PA-15
- PA-16
- PA-17
- PA-18
- PA-19
- PA-20
- PA-21
- PA-22
- PA-23
- PA-24
- PA-25
- PA-26
- PA-27
- PA-28
- PA-29

Range of Effects

The range of effects resulting from auditory and visual disturbance varies depending on the source and location of the impact, but in general the most likely potential impact includes disturbance. The most likely sources of auditory disturbance are associated with the operation of construction equipment and vehicles. Visual disturbance to covered species are most likely to be associated with use of temporary night lighting. The range of effects for these sources is

discussed in more detail below. The following PAs could result in potential auditory or visual disturbance.

PA-1 involves the operation of construction equipment and vehicles that may be required to complete certain SSPs. The operation of construction equipment and vehicles can result in elevated noise levels and create visual disturbance. Equipment and vehicles operate upon or adjacent to managed roadways, which have noise levels that vary based on traffic volumes and rate of travel. Elevated noise levels associated with construction equipment and vehicles will not reach levels that could cause injury to covered species, but may cause disturbance. Associated ABMPs will be implemented to avoid and minimize potential impacts.

PA-2 involves the use of temporary lighting for night construction activities. This PA could potentially cause visual disturbance or changes in the behavior of covered species. BMPs and ABMPs will be implemented to avoid and minimize potential impacts. No auditory disturbance is associated with temporary night lighting.

PA-27 involves the blasting of rock and other substrate and is not a commonly employed PA. It is generally employed for bridge and culvert replacement activities where the geologic conditions preclude other methods of grading and site preparation. The inclusion of BMPs and ABMPs will avoid and minimize potential auditory and visual disturbance.

The PAs identified in the bulleted list above are included because they could cause auditory or visual disturbance. The mechanism of impact is the operation of equipment. Therefore, the potential impacts associated with these PAs are the same as described above for PA-1.

Terrestrial Noise

Airborne terrestrial noise does not transmit effectively to water; no effects on listed aquatic species are expected from terrestrial activities that result in elevated noise. Terrestrial noise levels could potentially affect marine mammals when activities occur adjacent to or near marine or estuarine areas. Overall, the operation of construction equipment and vehicles (PA-1) and blasting rock and other substrate (PA-27) are the most likely to cause elevated noise levels that could potentially result in auditory disturbance to marine mammals. The operation of construction equipment and vehicles may generate noise levels that range from 74 dBA to 104 dBA, for non-impact equipment. Blasting for rock slope protection can generate noise levels up to 126 dBA. Traffic volumes on US 101, which parallels the coast, range from 460 vehicles per peak hour in Del Norte County (northernmost county in the coverage area) to 17,700 vehicles per peak hour in San Mateo County (southernmost county in the coverage area. Ambient noise levels generated by roadways with these traffic volumes range from approximately 70 dBA to 81+ dBA.

Marine mammals that occur at haulouts adjacent to roadways where SSPs are implemented are likely acclimated to elevated noise levels associated with traffic. Construction equipment and vehicles and blasting will not generate noise levels that will result in injury to marine mammals, but may cause disturbance.

Aquatic Noise

USFWS (Regions 1 and 8, which includes California); NMFS (Northwest and Southwest Regions); FHWA; the state transportation departments for California, Washington, and Oregon; and DFG signed a memorandum for the "Agreement in Principle for Criteria for Injury to Fish from Pile Driving Activities." Under this memorandum, the signatories agreed in principle to use the new criteria developed as part of the Fisheries Hydroacoustic Workgroup process. The new criteria supersede the earlier criterion of 180 dB_{PEAK} threshold for injury, and adds the cumulative SEL threshold. The memorandum stipulates the following criteria for injury (behavior is not addressed):

Criteria for Injury	**Agreement in Principle**
Peak	206 dB
Cumulative SEL	187 dB for fish 2 grams or larger 183 dB for fish less than 2 grams

The disturbance threshold for aquatic noise is $150dB_{RMS.}$ Sound pressure levels in excess of 150 dB_{RMS} are expected to cause temporary behavior changes, such as elicitation of a startle response, disruption of feeding, or avoidance of an area.

This document does not cover impacts associated with in-water or near-channel impact pile driving; therefore, aquatic noise will be limited to noise generated by construction equipment operating within the water column and by blasting.

The operation of construction equipment within the water column may exceed 150 dB_{RMS}; however, it is not expected to exceed the injury threshold. Construction equipment tends to produce the same type of slow-rise-time noise as do motor boats and ship engines. Jones & Stokes (2006) estimated that noise produced by a rather large ocean cable installation vessel is about 154 dB_{RMS}. JASCO (2005) estimated that noise produced by a rock-dumping vessel is approximately 177 dB (neither peak nor root-mean-square [RMS] were identified) at 1 meter, and Richardson et al. (1995 cited in Jones & Stokes 2006) estimated that an equipment support vessel produces noise levels at 152 dB_{peak} at 1 meter. Therefore, some of the same considerations applicable for boating traffic are appropriate for construction equipment in determining impacts on fish. Noise levels associated with in-water construction activities are not anticipated to reach the injury threshold; however, they are expected to reach the disturbance threshold and could affect fish behavior, habitat use, and migration patterns, should fish be present during construction.

The detonation of explosives in or near water produces post-detonation compressive shock waves characterized by a rapid rise to a peak pressure followed by a rapid decay to below ambient hydrostatic pressure. The latter pressure deficit causes most impacts on fish. The primary site of damage in finfish is the swim-bladder, the gas-filled organ that permits most pelagic fish to maintain neutral buoyancy. The kidney, liver, spleen, and sinus venous may also rupture and hemorrhage. Fish eggs and larvae may be killed or damaged (Wright and Hopky 1998). Studies show that an overpressure in excess of 100 kPa will result in these effects. The

degree of damage is related to the type of explosive; size and pattern of the charge(s); method of detonation; distance from the point of detonation; water depth; and species, size, and life stage of fish (Wright and Hopky 1998). Table 6.2 below provides an overview of the setback distance from fish habitat for a confined explosive based on substrate type.

Table 6-2. Setback Distance (m) from Center of Detonation of a Confined Explosive to Fish Habitat to Achieve 100 kPa Guideline Criteria for Various Substrates

Substrate Type	Weight of Explosive Charge (kg)							
	0.5	1	2	5	10	25	50	100
Rock	3.6	5.0	7.1	11.0	15.9	25.0	35.6	50.3
Frozen Soil	3.3	4.7	6.5	10.4	14.7	23.2	32.9	46.5
Ice	3.0	4.2	5.9	9.3	13.2	20.9	29.5	41.8
Saturated Soil	3.0	4.2	5.9	9.3	13.2	20.9	29.5	41.8
Unsaturated Soil	2.0	2.9	4.1	6.5	9.2	14.5	20.5	29.0

Adhering to these setback guidelines will ensure that blasting activities do not have an adverse impact on fish or fish habitat. Fish behavior may be affected by blasting, as fish migrate out of stream reaches that are affected by blasting activities. However, blasting will be relatively short in duration and fish will recolonize reaches affected by blasting once the activity has ceased.

Artificial Light

PA-2, the use of temporary lighting for night construction activities, may be implemented up to 5,141 times within the coverage area per year. Streetlights, security lighting, or navigational lights may also be replaced/installed along roadways and bridges. Nighttime artificial lighting has been shown to change fish species assemblages by:

- attracting fish to lighted areas,
- delaying salmonid migrations,
- increasing risk of predation,
- increasing predator avoidance and detection, and
- increasing prey capture success for some species of fish.

Impacts on fish from artificial lighting often result from changes in nighttime behaviors, such as migration, activity, location, and potentially schooling (Nightingale and Simenstad 2001b; Ali 1959, 1962, in Simenstad et al. 1999). Therefore, because behavior is different between species at differing life history stages and local environments, these factors can affect the response of covered species to artificial light. Behavioral differences in the response of salmonids to artificial light have been observed by several authors. For instance, ocean-type juvenile salmon, such as chum salmon and summer- and fall-run Chinook salmon, are attracted to lights at night (Simenstad et al. 1999), while Fields (1966, in Simenstad et al. 1999) found that spring-run juvenile salmon migrants were more repulsed by bright lights than were later migrants.

Potential impacts also depend on the fish's ability to adapt to dark or lighted conditions and the intensity and type of light. Ali (1959, in Simenstad et al. 1999) found that the eyes of sockeye salmon fry and smolts and coho salmon smolts adapt to light more slowly than do the eyes of coho, Chinook, and pink salmon fry.

Impacts on predator-prey relationships resulting from artificial lighting include increased risk of predation (Tabor et al. 1998; Kahler et al. 2000), increased predator avoidance and detection (Tabor et al. 1998), and increased success at capturing prey (Prinslow et al. 1979, in Nightingale and Simenstad 2001b; Nightingale and Simenstad 2001b).

The few studies that have examined predation rates on juvenile salmonids under varying light intensities have generally shown that within the natural range of light intensities (e.g., overcast skies, moonless nights, clear nights, moonlit nights), predation increases with increasing light (Patten 1971, Ginetz and Larkin 1976, Mace 1983, in Tabor et al. 1998). However, this cannot be extrapolated to determine the impacts of artificial night lighting for all species and life stages of fish. Ali (1959, in Simenstad et al. 1999) found that the maximum prey capture success for coho salmon fry and sockeye and coho salmon smolts was at light intensities equivalent to those found at dawn or dusk, whereas maximum prey capture success for sockeye and pink salmon fry was found to be equivalent to a cloudy day. Tabor et al. (1998) showed that under freshwater laboratory conditions, sculpin success at capturing sockeye salmon fry decreased with increased light. The authors also found that sculpin can capture sockeye salmon fry even in complete darkness. Although sculpin success at capturing sockeye salmon decreased with increasing light in a circular tank, the increased light slowed emigration of sockeye salmon fry in a simulated stream, and predation increased under the lighted conditions because of the slower migration rate. The light may have also caused the fry to migrate in areas of lower water velocity and closer to the bottom, leaving them more susceptible to predation by sculpin waiting, camouflaged against the substrate (Tabor et al. 1998).

Predation rates may also increase because of predator congregations in lighted areas. Prinslow et al. (1979, in Nightingale and Simenstad 2001b) observed chum salmon congregating at night below security lights in Hood Canal and suggested that lighting may provide increased feeding opportunities for chum salmon at night. Prinslow et al. also observed that dogfish (an important predator of herring and an occasional predator of juvenile and adult salmonids) were attracted to the security lights. Grebes, blue herons, and other birds have been observed feeding at night on the Cedar River delta in an area lit by Boeing Company facilities. Kahler et al. (2000) and Tabor (pers. comm., in Kahler et al. 2000) observed grebes foraging under lights at night on Lake Washington. Finally, Kahler et al. (2000) suggest that lighting attached to piers in Lake Washington where bass congregate may benefit bass by extending the duration of predation because it allows the visual predators to forage at night.

Performance Standard Benchmarks

Caltrans will implement the appropriate BMPs and ABMPs (Appendix C) and comply with all applicable federal, state, and local regulations and permit conditions during construction.

Summary

Any impacts that could be attributed to terrestrial noise are not expected to translate into measurable effects on covered species or their prey. Aquatic noise impacts from construction impacts may potentially reach the threshold for disturbance (150 dB_{RMS}), but no PA is expected to generate aquatic noise to the threshold of injury (206 dB_{PEAK}). Impacts on covered species as a result of artificial light during construction are not well understood. The studies cited above indicate that artificial light has mixed effects; many are potentially detrimental, and all represent a change from natural patterns of behavior. BMPs and ABMPs addressing the use of temporary lighting for night construction activities near surface waters will minimize the potential for impacts from artificial light.

Benefits of SSPs

Terrestrial and aquatic noise and artificial light are not anticipated to have any beneficial effect on covered species or other organisms.

Impact Thresholds

BMPs and ABMPs will be implemented for each PA that could elevate noise levels within the aquatic environment to minimize or avoid potential impacts on covered species. Disturbance to covered species could occur as a result of these PAs, should such species be present. The general thresholds at which potential impacts on covered species may occur are discussed below.

In general, PAs that may result in temporary auditory, visual, or vibratory disturbance will not result in significant negative impacts on covered species or their designated critical habitat, assuming all applicable BMPs and ABMPs are implemented.

No Effect:

- PAs that could result in auditory, visual, or vibratory disturbance to covered species occur in areas where covered species and their designated or proposed critical habitat are not present.

May Affect, Not Likely to Adversely Affect:

- PAs that could cause auditory, visual, or vibratory disturbance to covered species occur in areas where covered species are present, and during times of the year when one or more of these species may be present.
- PAs that could cause auditory or vibratory disturbance to covered species result in aquatic sound levels that exceed 150 dB_{RMS}, yet will remain below the "Agreement in Principle, Criteria for Injury" threshold of 206 dB_{PEAK} or the cumulative SEL of 187 dB for fish greater than or equal to 2 grams, or 183 dB for fish less than 2 grams.

May Affect, Likely to Adversely Affect:

- PAs that could cause auditory, visual, or vibratory disturbance to covered species occur in areas where covered species are present, and during times of the year when one or more of these species may be present.

- PAs that could cause auditory or vibratory disturbance to covered species result in aquatic sound levels that exceed ambient aquatic sound levels, and which may exceed the "Agreement in Principle, Criteria for Injury" threshold of 206 dB_{PEAK} or the cumulative SEL of 187 dB for fish greater than or equal to 2 grams, or 183 dB for fish less than 2 grams. Exceedance of these thresholds may cause injury to covered species and could occur as a result of PA-27 (Blast rock and other substrate) and PA-28 (Capture, handle, exclude, salvage, and relocated covered species).

6.2.4 Disturbance and Injury

Source of Impact and PAs Involved

Fish removal, exclusion, or handling will be required to successfully complete several SSPs in certain situations. PA-28 specifically addresses the capture, handling, exclusion, salvage, and relocation of covered species.

Range of Effects

Fish Removal and Exclusion

Fish removal and exclusion is performed using either passive methods, such as the volitional movement of fish from the construction area during its slow dewatering, or through active methods, such as the use of hand nets, beach seining, or electrofishing equipment to capture and move fish from the construction area (National Marine Fisheries Service 2003b).

Passive capture of fish typically involves installing an upstream block net and a cofferdam, and slowly dewatering the construction area. It has been suggested that reductions in flow of 80% result in the greatest number of fish (approximately 50% to 75%) volitionally moving out of the dewatered construction area (National Marine Fisheries Service 2006a). This type of passive fish removal eliminates the need to capture and handle some fish.

More active methods of fish removal include the use of a beach seine to "encourage" fish to move downstream to a point beyond the construction area, where dewatering will not occur. Another block net is installed at the downstream-most point to exclude fish from moving back upstream and entering the construction and dewatering areas. Once the block nets are in place, several passes of the construction area may be made with the nets and/or beach seine to capture any fish that may remain within the construction area. Once fish are no longer being captured with the beach seine, a portable electrofishing unit can be employed to ensure that all fish have been removed from the construction area prior to initiating work or dewatering (National Marine Fisheries Service 2003b).

Captured fish are typically released downstream of the construction area. Depending on the number of fish captured and the size of the stream, fish may be released at multiple sites to minimize overcrowding of available habitat (National Marine Fisheries Service 2003b).

Beach seining can affect fish in several ways, including stress, scale loss, physical damage, suffocation, and desiccation, all of which have the potential to result in incidental take. The amount of unintentional injury and mortality attributed to seining can vary widely depending on the seine used, ambient conditions, and expertise of the field crew (National Marine Fisheries Service 2003b). However, adverse effects are minimal for seining compared to electrofishing,

and first using a seine to remove fish will minimize the adverse effects of electrofishing (National Marine Fisheries Service 2003b).

Electrofishing can kill both juvenile and adult fish if improperly conducted. Mortality can be immediate as a result of trauma or delayed as a result of disease or fungal attack. Researchers have also found that sublethal effects, including spinal injury, occur (National Marine Fisheries Service 2003b; Snyder 2003). Although fish may receive spinal injuries as a result of electrofishing, research indicates that few die of these injuries. However, severely injured fish grow at slower rates and sometimes show no measurable growth (National Marine Fisheries Service 2006b).

Fish Entrainment

Dewatering a portion of a stream channel requires a flow bypass system and may rely on either gravity or a pump to convey the flow around the dewatered portion of the channel. This type of activity has the potential to entrain fish within the bypass system, which could result in injury to covered species.

Performance Standard Benchmarks

Caltrans will implement the appropriate BMPs (Appendix C) and ABMPs, as well as comply with all applicable federal, state, and local regulations during construction.

Summary

Capture-related take, such as injury or mortality from electrofishing, varies from 2% (no distinction between injury and mortality) (National Marine Fisheries Service 2006a) to 30% (25% injury, 5% mortality) (National Marine Fisheries Service 2006b) of fish captured using electrofishing equipment. Some biological opinions did not distinguish between methods of capture (e.g., volitional movement of fish from the project site during slow dewatering, capture by seining or dip-netting, capture by electrofishing). One biological opinion estimated take due to stranding (i.e., fish not captured and removed and thus remaining in the work area to be dewatered) at 8% (National Marine Fisheries Service 2006b). All such injury and mortality represent incidental take directly attributable to this PA.

Benefits of SSPs

The benefit of fish removal and exclusion is that fish will not occur within the isolated work area during construction, and therefore potential impacts associated with exposure to construction activities will be avoided.

Impact Thresholds

Fish removal, exclusion, or handling could be required to complete certain PAs and avoid or minimize potential impacts on fish. ABMPs will be implemented to minimize or avoid impacts on covered species associated with fish exclusion and handling. The general thresholds at which potential impacts on covered species may occur as a result of the implementation of this PA are discussed below.

In general, PA-28 may result in disturbance or injury to covered species if implemented. It is not anticipated that implementation of PA-28 will result in temporary or permanent modification

of designated critical habitat of any of the covered species, assuming all applicable ABMPs are implemented.

No Effect:

- PA-28 occurs in a water body that is not occupied by covered species, but may be occupied by other fish species that are not federally protected.

May Affect, Not Likely to Adversely Affect:

- PA-28 occurs in a water body that could be occupied by covered species.
- PA-28 requires the use of beach seines to exclude fish from the work area. No electrofishing, dip nets, or fish capture and handling is required (i.e., a beach seine can be deployed waterward from shore, eliminating the need to capture and handle fish; such activities do not span the entire channel).

May Affect, Likely to Adversely Affect:

- PA-28 occurs in a water body that is or could be occupied by covered species.
- PA-28 requires the use of beach seines, dip nets, and/or electrofishing and will require covered species to be captured and handled.

6.2.5 Impacts on Designated Critical Habitat for Pacific Salmon and Steelhead

The ESUs and DPSs addressed in the designation of critical habitat share many of the same rivers and estuaries, have similar life history characteristics, and have many of the same primary constituent elements (PCEs) in their preferred habitats. These PCEs include sites essential to support one or more life history stages of the ESU or DPS (sites for spawning, rearing, migration, and foraging). These sites in turn contain physical or biological features essential to the conservation of the ESU or DPS (e.g., spawning gravels, water quality and quantity, side channels, forage species). The specific PCEs are addressed below.

Spawning Sites

Spawning sites require water quantity and quality conditions and substrate that support spawning, incubation, and larval development. High-quality spawning grounds are necessary for successful propagation. Salmon require pea- to cobble-sized gravel free of sediment that might suffocate eggs. During their incubation in the gravel, salmon eggs are particularly vulnerable to increased sediment and water quality degradation. The CAs will have no effect on water quantity.

The impacts on water quality that could occur from the CAs were discussed previously in Section 6.2.1**.** These effects are considered insignificant or discountable in rivers or streams that provide spawning habitat because of the BMPs that will be employed.

Increased sedimentation from the CAs could potentially fill interstitial spaces in spawning gravels if the activities occur in rivers or streams that provide spawning habitat. To minimize

turbidity and sedimentation during construction, BMPs will be incorporated during construction activities to avoid or minimize such impacts.

Rearing Sites

Rearing sites require 1) water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; 2) water quality and foraging opportunities to support juvenile development; and 3) natural cover such as shade, submerged and overhanging LWD, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

- **Water Quantity:** Once salmon and steelhead have hatched and left the gravel, they remain in fresh water from a few weeks to 2 years. During this time, the fish require pools and riffles in which to hold, feed, and avoid predators. There must be sufficient water in those freshwater areas to afford rearing habitat. The CAs will in no way influence water quantity.
- **Floodplain Connectivity:** The CAs are not expected to affect floodplain connectivity because the CAs entail only the maintenance of existing structures and facilities. No new construction or expansion of existing structures or facilities will be covered. Therefore, the CAs are not expected to degrade or improve floodplain connectivity.
- **Water Quality:** The impacts on water quality that could occur from the CAs were discussed previously in Section 6.2.1. These effects are considered insignificant or discountable to rearing habitat because of the BMPs that will be employed.

Short-term impacts on benthic invertebrates, a primary constituent of a juvenile salmonid diet, could occur from several actions covered in this PBA, including drainage system maintenance and repair; bridge or culvert repair, retrofit, replacement, and maintenance; and slide abatement and repair. However, benthic invertebrate populations are expected to recover relatively quickly following these repair and maintenance activities. Because new invertebrate communities will recolonize the affected area and the impact area of the CAs is relatively small, no long-term loss of biological productivity or prey base for juvenile salmonids is expected.

The impacts on shoreline, riparian, and aquatic vegetation and habitats were discussed previously in Section 6.2.2. These effects are considered insignificant or discountable to rearing habitat because of the BMPs that will be employed and the small scale of the CAs (i.e., routine maintenance work with no construction of new facilities or expansion of existing ones).

Migration Corridors

Migration corridors must be free of obstruction, have healthy water quantity and quality conditions, and have natural cover such as submerged and overhanging LWD, aquatic vegetation, large rocks and boulders, side channels, and undercut banks to support juvenile and adult mobility and survival.

The ability to migrate is critical to the persistence of salmonid populations. Salmon rely on migratory corridors to move from spawning and rearing habitats to the ocean for foraging and growth, and back to fresh water for spawning. The use of migratory corridors by salmon also results in increased dispersion, facilitating gene flow among local populations when individuals

from different local populations interbreed or stray. Also, local populations that have been extirpated by catastrophic events may become reestablished as a result of movements by salmon and steelhead through migratory corridors.

The shadow cast by overwater structures is thought to discourage juvenile salmonids from passing beneath the structure, thereby forcing the fish into deeper water. Overwater structures can also create ambush sites or spawning habitat for predators. However, except for temporary stream crossings, the CAs do not include the expansion or construction of any new overwater structures or facilities, and therefore will not create additional delays or hindrance to migration. Temporary stream crossings would typically only be installed during in-water work windows, when most salmonids are not migrating. The CAs will have no effect on water quantity.

The impacts on water quality that could occur from the CAs were discussed previously in Section 6.2.1. These effects are considered insignificant or discountable in migration corridors because of the BMPs that will be employed.

The impacts on natural cover such as shoreline, riparian, and aquatic vegetation and habitats were discussed previously in Section 6.2.2. These effects are considered insignificant or discountable to migration corridors because of the BMPs that will be employed and the small scale of the CAs.

Estuarine Areas

Estuarine areas must be free of obstruction and have water quality and salinity conditions that support juvenile and adult physiological transitions between fresh water and salt water. Additionally, estuarine areas must have natural cover such as submerged and overhanging LWD, aquatic vegetation, large rocks and boulders, and side channels, as well as juvenile and adult forage, including aquatic invertebrates and fishes, to support growth and maturation.

It is widely believed that estuaries are an important habitat for young salmon, despite the fact that salmon only reside there seasonally. There are three main hypotheses regarding the functional significance of estuaries: feeding, transition to the marine environment, and predator avoidance (Quinn 2005). Estuaries are particularly important nurseries for ocean-type juvenile Chinook salmon. These habitats offer salmon transitional areas for marine environment adaptation, refuge from predation, and abundant feeding and growth opportunities (Simenstad et al. 1982). Survival of adult Chinook salmon is relatively higher in river basins that have pristine estuaries (as indicated by the proportion of unaltered salt marshes, eelgrass beds, and other shallow habitats) than in more extensively altered systems (Magnusson and Hilborn 2003).

The potential of CAs creating obstructions was discussed previously in this chapter under “Migration Corridors.” The effects are considered insignificant because, except for the occasional use of a temporary stream crossing, no new permanent infrastructure that would cast shadows on the water will be created by the CAs.

The impacts on water quality that could occur from the CAs were discussed previously in Section 6.2.1. These effects are considered insignificant or discountable in estuarine areas due to the BMPs that will be employed.

The impacts on natural cover such as shoreline, riparian, and aquatic vegetation and habitats were discussed previously in Section 6.2.2. These effects are considered insignificant or discountable to estuarine areas because of the BMPs that will be employed and the small scale of the CAs.

Impacts on benthic invertebrates were discussed previously in this chapter under “Rearing Sites.” These effects are considered insignificant or discountable because of the relatively quick recovery of these populations and the small scale of the CAs.

Nearshore Marine Areas

Nearshore areas must be free of obstruction and must have water quality conditions and forage such as aquatic invertebrates and fishes to support growth and maturation. Additionally, nearshore areas must have natural cover such as submerged and overhanging LWD, aquatic vegetation, large rocks and boulders, and side channels.

Salmonids exhibit a broad range of life histories, including some with extensive use of the nearshore area. In this region, juveniles first adjust to the saltwater phase of their life and adults look for cues to find their way back to their natal stream. As with estuaries, the nearshore environment is where juvenile salmon adjust to life in the ocean, growing as quickly as possible while avoiding predators. Therefore, it is important that the nearshore marine environment is free of obstruction and provides salmon with a prey base.

The potential for CAs to create obstructions was discussed previously in this chapter under “Migration Corridors.” The effects are considered insignificant because no new permanent infrastructure that would cast shadows on the water will be created by the CAs.

The impacts on water quality that could occur from the CAs were discussed previously in Section 6.2.1. These effects are considered insignificant or discountable in nearshore areas because of the BMPs that will be employed.

Impacts on benthic invertebrates were discussed previously in this chapter under “Rearing Sites.” These effects are considered insignificant or discountable because of the relatively quick recovery of these organisms and the small scale of the CAs.

The CAs do not include the expansion of any existing structures or construction of new facilities. Therefore, minimal impacts are expected on eelgrass and micro- and macroalgae, which support forage fish**.** In addition, work will comply with appropriate timing windows to restrict construction activities at documented forage fish spawning habitat during the spawning period. The effects on forage from the CAs are expected to be minor and temporary.

The impacts on natural cover such as shoreline, riparian, and aquatic vegetation and habitats were discussed previously in Section 6.2.2. These effects are considered insignificant or discountable to nearshore marine areas because of the BMPs that will be employed and the small scale of the CAs.

Offshore Marine Areas

Offshore marine areas require water quality conditions and forage, including aquatic invertebrates and fishes, to support salmonid growth and maturation. The CAs will not occur in offshore marine areas and therefore will have no impact on these areas.

Summary

The CAs include only maintenance, repair, and replacement of existing structures and facilities managed by Caltrans. Therefore, potential impacts on the PCEs of designated critical habitat for Pacific salmon and steelhead would only be associated with construction activities, which are not anticipated to have a measurable long-term or permanent impact on any of the PCEs**.** The inclusion of BMPs will avoid or minimize potential temporal impacts on water quality, water quantity, benthic disturbance, riparian and shoreline vegetation, and foraging opportunities.

Impact Thresholds

Impacts on designated critical habitat for Pacific salmon and steelhead could be caused by the CAs that could potentially impact water quality, sedimentation, floodplain connectivity, hydrology, cover, or forage. All of the covered PAs, except PAs 2 and 28, have the potential to impact at least one PCE of designated critical habitat for Pacific salmon and steelhead. BMPs will be implemented to avoid or minimize these impacts in surface waters affected by the CAs. The general thresholds at which PCEs for designated critical habitat for Pacific salmon and steelhead may be affected when a covered activity is implemented are discussed below.

In general, the impacts listed above that are caused by CAs will not affect PCEs for designated critical habitat for Pacific salmon or steelhead under the following circumstances, assuming all applicable BMPs are implemented. No impact on designated critical habitat for Pacific salmon or steelhead would be expected if all activities occur 100 feet or more from surface waters that support such habitat, activities occur outside the 100-year floodplain of such surface waters, and treated water does not discharge directly into these surface waters. If in-channel work or work below the OHWL does occur, there would be no impact on designated critical habitat if the surface waters do not support such habitat. Additionally, if all equipment fueling occurs off-site from the project and outside 300 feet from any surface waters containing designated critical habitat, then no impact would be expected to occur.

In general, the impacts on designated critical habitat for Pacific salmon and steelhead caused by the CAs may affect PCEs under the following circumstances, assuming all applicable BMPs are implemented. Impacts could potentially occur if activities occur within 100 feet of surface waters that contain designated critical habitat; activities occur within the 100-year floodplain of such surface waters; or water is redirected, diverted, drafted, or discharged directly to or from such surface waters.

Salmonid critical habitat PCEs may benefit from the placement of slope protection devices if the devices prevent catastrophic slope failure and associated input of fine sediment. Salmonid critical habitat may also be improved by the installation of improved culverts, bridges, or gradient control structures that reduce any erosion or deposition of sediments associated with these structures, and allow increased passage of fish to upstream habitats. The implementation of

BMPs will benefit salmonid critical habitat because the BMPs will minimize or avoid impacts on listed aquatic species and their habitat.

6.2.6 Impacts on Proposed Critical Habitat for Green Sturgeon of the Southern DPS

Critical habitat for green sturgeon of the southern DPS was designated on September 8, 2008. The proposed critical habitat is broken down to the Primary Constituent Elements (PCEs), similar to salmon and steelhead designated critical habitat. The freshwater PCEs for green sturgeon include; food resources, substrate type and size, water flow, water quality, water depth and sediment quality. The marine PCEs for green sturgeon include migratory corridors, water quality and food resources. These in turn contain physical or biological features essential to the conservation of the DPS (e.g., spawning gravels, water quality and quantity, forage resources).

Within the coverage area, proposed critical habitat includes San Francisco, San Pablo and Suisun Bays and coastal waters along the entire coverage area. The implementation of the covered activities within these areas will be limited and no covered activities are anticipated to occur directly within these waters. The project actions are not expected to have a measurable impact on any of the PCEs identified above.

6.3 Indirect Effects

Indirect effects are caused by or will result from the proposed action. They occur later in time (generally after the construction period), but are still reasonably certain to occur. Indirect impacts may result from the operation of the project or future activities related to the project (e.g., future impacts from trail use, induced land use change or growth, and increased traffic).

The activities covered within this PBA include the routine maintenance, repair, and replacement of existing structures and facilities, as well as preventative maintenance activities to preserve existing infrastructure. The activities covered do not include the construction of any new structures or facilities, or expansion of any existing ones. All activities will be single and complete actions; therefore, indirect impacts associated with operational activities and modifications in behavior may occur.

6.3.1 Operational Activities

The CAs will not modify the existing use (i.e., increase or decrease traffic volumes) of infrastructure managed by Caltrans or the operational activities associated with the infrastructure. Indirect effects associated with the use of existing roadways and the routine maintenance, repair, and replacement of existing structures and facilities will not have any measurable indirect effects on covered species or their designated critical habitat.

The CAs are limited to maintenance and safety improvement activities such as the repair and replacement of transportation infrastructure, not the expansion of existing infrastructure or construction of new infrastructure. Therefore, the CAs will not increase the capacity of the overall transportation system. The CAs do not include the construction of new infrastructure features or the expansion of existing ones (e.g., roadway widening to accommodate increased

traffic volumes). Therefore, no changes in current land use or increased development are anticipated to result from implementing the CAs.

6.3.2 Behavior Modifications

The CAs include the repair and replacement of structures such as culverts or bridge structures, and the removal of aquatic and riparian vegetation. Replacement of culverts may affect stream habitat through localized modifications to flow and substrate composition over time, particularly if an existing culvert is undersized and replaced with an appropriately sized culvert. Most modifications associated with culvert replacement are anticipated to improve conditions over time for covered salmon and steelhead.

Replacement of bridge structures may maintain existing conditions or potentially improve conditions, depending on the nature of the modifications. For example, if existing bridge support structures are located waterward of the OHWL and replacement support structures will be located landward of the OHWL, such modifications would be an improvement for flow, passage of debris, and substrate composition because the channel would function more appropriately.

Removal of aquatic and riparian vegetation may have a localized effect on habitat by allowing surface waters to be exposed to additional solar radiation, modifying existing habitat conditions, and reducing potential future LWD recruitment. Impacts associated with such changes will be localized and temporary because the areas affected are recolonized over time.

These potential impacts may affect the behavior of certain species as they adapt to localized changes in habitat that may result from the CAs. The changes may be beneficial, such as changes in habitat associated with the replacement of an undersized culvert with an appropriately sized culvert. Some changes, such as the removal of vegetation, may also degrade habitat conditions, and species may avoid areas previously occupied. Changes associated with removal of vegetation will be temporary, and vegetation will recolonize over time.

6.3.3 Indirect Effects from Water Quality Changes or Displacement and Exposure

Changes in water quality, particularly degradation, could affect the behavior of covered species by influencing fish movement. Degradation to water quality could displace fish from suitable areas to less suitable areas. Such a change in fish behavior could expose fish to increased predation, increased competition, or decreased foraging success.

The potential for any measurable long-term degradation to water quality associated with the CAs is low. Temporary impacts on water quality will occur with certain CAs, primarily an increase in turbidity. No measurable long-term changes to water quality are anticipated as a result of the CAs.

6.4 Effects of Interrelated and Interdependent Actions

An interrelated action is one that is part of a larger action and depends on the larger action for its justification. The proposed action itself can be part of a larger action or may require additional related actions for its completion. An interdependent action is an action that has no independent utility apart from the proposed action.

The activities covered within this PBA include the routine maintenance, repair, and replacement of existing structures and facilities, as well as preventative maintenance activities to preserve existing infrastructure. The activities covered do not include the construction of any new structures or facilities, or expansion of any existing ones. All activities will be single and complete actions; therefore, no impacts from interrelated or interdependent actions will occur.

6.5 Cumulative Effects

The ESA definition of cumulative effects is different than the National Environmental Policy Act (NEPA) definition of cumulative effects. Under the ESA, cumulative effects are the effects of future state, local, or private (but not federal) actions (unrelated to the proposed action) that are reasonably certain to occur within the action area of a proposed project. Cumulative effect analyses are required by the ESA only for those actions undergoing formal consultation.

Because of the relatively large coverage area of this PBA, it is difficult to identify specific future state, tribal, local, or private actions that are reasonably certain to occur within the coverage area. However, general trends in land use, development, and population growth do provide some indication of what can be expected in the future. State, tribal, local, or private actions that may affect listed species within the coverage area include timber management, suppression of wildfires, industrial activities, population growth, legislative actions, and residential and commercial development. These actions, while broad in scale, are likely to continue into the future at a rate similar to that experienced in the past. No specific actions are identified or presented below.

6.5.1 Timber Management

Timber management is prevalent within the coverage area and includes, for example, the harvest yarding, loading, and hauling of timber; site preparation, such as identifying areas of harvest; and road building. Timber management also includes the replanting of harvest areas, vegetation management, and thinning.

Future timber harvest levels in the coverage area cannot be predicted; however, it is assumed that, for the foreseeable future, levels will be within the approximate range of those occurring since the listing of the northern spotted owl in 1992. Based on data for 1992 through 2005 for the counties within the coverage area, the average annual harvest level is expected to be about 1,023 million board feet (MMBF), with most of the harvest occurring in Humboldt, Mendocino, and Siskiyou Counties (Spero 2006). It is assumed that this harvest will adhere to the California Forest Practice Rules (CFPRs), ESA, and CESA, and that any take of covered species will be avoided or conducted according to sustained yield plans (SYPs), habitat conservation plans (HCPs), or incidental take permits (ITPs).

Facilities are expected to operate within applicable laws. Where wastewater discharge may affect habitat for listed species, it is expected that the ESA and CESA will be enforced. Most sawmills processing logs from timber harvest activities in the coverage area are expected to remain in operation for the foreseeable future, based on a relatively steady supply of timber, as discussed above. The reduction in available old-growth logs will probably result in closure or retooling of those mills designed to process large logs (U.S. Fish and Wildlife Service 1999).

Implementation of timber harvest plans (THPs) under the CFPRs has not consistently provided protection against unauthorized take in relation to Pacific salmon protected under the ESA by the NMFS, such as coho salmon. An independent scientific review panel found in 1999 that the CFPRs and their implementation did not adequately achieve functioning habitat conditions necessary to protect listed salmonids (Ligon et al. 1999). Following that finding, the California State Board of Forestry and Fire Protection (CSBOFFP) adopted interim rules to attempt to strengthen the CFPRs. Overall, the NMFS continues to find that the implementation of these interim rules still does not "ensure the achievement of properly functioning habitat for conservation of anadromous salmonids throughout their range in California" (Simpson Resource Company 2002). Until these issues are resolved, unauthorized take from direct and indirect effects on covered salmonids from timber harvest and its associated activities may occur. The extent and amount of any unauthorized take of salmonids are unknown.

Reasonably foreseeable effects of timber management activities may also affect designated critical habitat for covered species within the coverage area. Within the coverage area, direct and indirect effects of timber management, the effects of interrelated and interdependent actions, and cumulative effects may degrade the PCEs of Pacific salmon and steelhead designated critical habitat that are present within the coverage area.

6.5.2 Suppression and Control of Wildfires

The California Department of Forestry and Fire Protection (CAL FIRE), in conjunction with other state and federal agencies, may be involved in the suppression or control of wildfires. Suppression or control measures may include thinning and removal of fuels (e.g., trees, downed branches, litter), conducting prescribed burns before a wildfire incident, constructing fire breaks, setting backfires, and cooling the fire edge with water. Equipment such as helicopters, aircraft, engines, bulldozers, and hand crews operate at various times of the year. These activities may result in the disturbance of covered species. An undetermined number of individuals may be affected by this activity on annually during each year of the permit period.

In addition, suppression or control of wildfires may include the removal or modification of vegetation as a result of the construction of firebreaks or the setting of backfires to control the spread of fire. An undetermined amount of suitable habitat for covered species may be removed or modified by this activity. During the past 10 years, there have been an undetermined number of fires affecting an undetermined number of acres of land in the coverage area.

6.5.3 Industrial Activities

Currently, an unknown number of quarrying, gravel mining, and associated processing operations are located within the coverage area, and will likely continue to be operated by non-federal parties. Current operations fall under the jurisdiction of the California Coastal Commission (for those activities conducted within the state's coastal zone), the Corps, and any applicable local governments, and will likely continue to do so in the future. Future demand cannot be estimated, but it may increase as private timber and agricultural landowners look for ways to increase revenue generated from their lands (U.S. Fish and Wildlife Service 1999).

The effects on listed species from quarries and rock mines depend on the type of mining, size of the quarry or mine, and distance from surface waters and groundwater features. Rock mining

near surface waters can cause increased sedimentation, accelerated erosion, incised streambanks, streambed instability, and changes to substrate (U.S. Fish and Wildlife Service 1999). Surface mining may compact soils, remove vegetative cover and the humic layer, and increase surface runoff. Mining may also cause the loss of riparian vegetation and cause the transportation of toxic chemicals to surface waters (U.S. Fish and Wildlife Service 1999). Because the effects of quarries and rock mines depend on several variables, the effects of the operations on covered species within the coverage area are unknown.

6.5.4 Population Growth

The U.S. Census Bureau (2007) estimated California's population at approximately 36.5 million in 2006, reflecting a 13.82% growth in population between 1990 and 2000. The state population is projected to increase to about 40.1 million by 2015. California had the 18th-highest population growth by percentage among all states in that time period. However, most of this population growth was concentrated outside the northern coastal areas covered under this PBA, with only three of the counties within the coverage area experiencing growth rates above the state average (Sonoma at 18.13%, Del Norte at 17.25%, and Contra Costa at 18.05%). Trinity County experienced a negative growth rate for that time period (loss of 0.31%). The areas with the highest population densities are in the coastal areas surrounding the major cities of Los Angeles, San Diego, and the San Francisco Bay Area, as well as within the interior valleys such as the Sacramento Valley (U.S. Census Bureau 2007). Future growth patterns are expected to continue to follow historical patterns.

6.5.5 Legislative Actions

State, tribal, and local government actions can also be in the form of legislation, administrative rules, or policy initiatives. Government or private actions may include changes in land and water uses, including ownership and intensity, that could adversely affect listed species or their habitat. While specific government actions are subject to political, legislative, and fiscal uncertainties, changes in the economy that have occurred in the last 15 years are likely to continue, with less large-scale resource extraction, more targeted extraction, and significant growth in other economic sectors (National Marine Fisheries Service 2005).

6.5.6 Residential and Commercial Development

Population growth results in increasing residential and commercial development. Primary effects of land development include direct habitat loss, decreased water quality, contamination of natural resources (e.g., groundwater, surface waters, land), changes to runoff patterns, habitat fragmentation, isolation of wildlife populations, and decreased habitat diversity. As development increases, the general quantity and quality of habitat suitable for threatened and endangered species will most likely decrease.

The amount of buildout associated with the projected population growth will likely lead to further habitat degradation, focused primarily in current metropolitan areas. Actions taken to mitigate for the potential impacts of development, such as avoidance of habitat critical to species survival and conservation, as well as strong urban/rural boundaries, can help minimize and slow the rate of habitat degradation, in some instances avoiding degradation entirely.

Chapter 7 Effect Determinations

The effect determination for any species depends on the specific effects of the PAs implemented to complete a specific SSP, and the chemical, physical, and biological conditions the species is subject to within the project action area. Impacts on species occur primarily through two general pathways: direct impacts on the species (e.g., mortality, harassment), and indirect impacts through modification of the species' habitat (e.g., loss of shelter for predator avoidance and/or physiological maintenance). Effect determinations for listed species will vary across and between SSPs depending on the PAs implemented and the prevailing site conditions at the time of implementation. The same SSP could result in different effect determinations for different species. The effects determinations presented below account for: 1) individual effect determinations for each species for each PA, and 2) the aggregate of the individual effects on each species associated with the PAs.

7.1 PBA Effect Determination Overview

Three potential effect determinations can be made for each PA: No Effect (NE), Not Likely to Adversely Affect (NLTAA), and Likely to Adversely Affect (LTAA). The NE determination is appropriate if the listed species does not occur within the project action area, or if individuals of the species will not be present within the range of impacts during construction activities, as long as there are no impacts on the habitat that may be occupied at a later time by the species, designated critical habitat will not be modified, and/or prey species will not be measurably affected or simply if the project's nature has no potential to affect an individual or its habitat. An NLTAA determination is appropriate if the species could be present during construction activities, but impacts on the covered species will be minor and will not result in take. An LTAA determination is appropriate if direct or indirect take of the covered species is expected due to implementation of a specific PA.

It is the task of the Caltrans project biologist to determine which conditions exist for each of the covered species during the project (and after if changed conditions are permanent or long-lasting), and what the responses and response thresholds (i.e., noise response threshold) are for each species under those conditions. This analysis is supported by the Project Effect Determination and Categorization Form (Appendix B), which allows the analyst to systematically define and evaluate the effects of a project's operative conditions on each covered species within the project action area. Based on this information a professional judgment can be made of the most likely effects of each PA on listed species.

The biological assessment of any project must provide a single effect determination, reflecting the impacts of the project as a whole, for each species and its designated critical habitat. This assessment concludes that the described program will adversely affect all of the covered species; individual activities also will have site specific affects on species and habitat that will affect how the activities are reported on and whether review and concurrence regarding the projects is required to determine if the site specific activity is consistent with, and covered by, the PBO.Therefore, the project biologist must systematically consider all of the potential effects associated with various PAs required to implement a specific SSP (not all PAs will be required to

complete an SSP). These PAs must then be evaluated in combination to develop an overall effect determination for the SSP for each species. A worksheet that lists all of the affected species and all PAs, and the effect determinations associated with each PA, supports this analysis (Table 7-1). The biologist can determine the range of effects for each species across all PAs and then determine which effect is most representative of the specific SSP for that species. In accordance with the precautionary principle (Noss et al. 1997), the most severe effect in a project's range of effects is commonly used to define the overall effect determination for that project (Table 7-1).

These overall determinations may or may not be fully representative of the same SSP implemented at many different locations throughout the PBA coverage area. For example, some covered species occur in only a limited number of locations. Implementation of an SSP at one of these locations could result in an LTAA determination for those species, while implementation of the same SSP at another site within the coverage area would not affect these geographically limited species and therefore would likely receive an overall determination of NE for those species. Likewise, an SSP may occur when a covered species is not present within the project action area, but may modify its habitat, resulting in a determination of NLAA. Proportionally, the latter determinations are more representative of the effect of the covered activities that will occur within the coverage area. But the more conservative overall project determinations based on the exceptional project involving unique species locations serve as an important flags for the biologist to carefully examine the potential for each species to occur within the project action area. Moreover, the more conservative overall determinations are more likely to cover synergistic effects from implementation of different PAs not readily evident from analysis of the effects of individual PAs.

7.2 Effect Determinations

The following sections provide programmatic effect determinations for fish (salmon, steelhead, and green sturgeon); marine turtles; marine mammals (whales and sea lions); and their designated critical habitat that occur within the PBA coverage area and are under the jurisdiction of NMFS. Each section identifies PAs and conditions that will result in NE, NLTAA, and LTAA determinations. Those SSPs that do not meet the specifications of this PBA may require redesign to achieve consistency with the specifications of the PBA, or the initiation of a project-specific (individual) biological assessment (BA) and Section 7 consultation with NMFS. The effect determinations presented below are grouped by species that have similar life history strategies or occupy similar habitats and will be affected similarly by an SSP (e.g., salmon and steelhead); species that do not share such characteristics are treated singly (e.g., green sturgeon).

The effect determinations provided here are based on the analysis presented in this PBA. Some species may have more than one effect determination depending upon the PAs required to complete a specific SSP and/or the location of a particular SSP. These instances are mentioned below for each species or group of species, as appropriate.

Information regarding the status, habitat requirements, and ecology of federally listed species that are known or likely to occur in the defined project action area for the covered activities, is provided in Appendix A.

Table 7-1. Mechanisms of Impact and Potential Direct and Indirect Effects

Site-Specific Project	Potential Impact Mechanisms	Potential Direct Effects	Potential Indirect Effects
PA-1:Operate construction equipment and vehicles	• Equipment operation • Excavation/fill • Temporary ingress or egress • Vegetation disturbance or removal	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-2: Use temporary lighting for night construction activities	• Equipment operation	• Auditory, visual, or vibratory disturbance	• Behavioral modifications
PA-3: Maintain and fuel construction equipment and vehicles	• Equipment operation	• Water quality	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-4: Clean the roadway of sediment and debris during and following maintenance and construction activities	• Equipment operation	• Water quality • Auditory, visual, or vibratory disturbance	• Indirect effects from water quality changes or displacement and exposure
PA-5: Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance	• Indirect effects from water quality changes or displacement and exposure
PA-6: Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure	• Equipment operation	• Water quality • Auditory, visual, or vibratory disturbance	• Indirect effects from water quality changes or displacement and exposure
PA-7: Treat and discharge water conveyed from the construction area	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal • Hydraulic modification	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance	• Indirect effects from water quality changes or displacement and exposure
PA-8: Use drill rigs and drilling lubricants	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal • Fish exclusion and handling	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure

Table 7-1. Mechanisms of Impact and Potential Direct and Indirect Effects

Site-Specific Project	Potential Impact Mechanisms	Potential Direct Effects	Potential Indirect Effects
PA-9: Paint, wash, seal, and caulk bridges, guardrails, and other infrastructure	• Equipment operation	• Water quality • Auditory, visual, or vibratory disturbance	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-10: Remove and disturb upland, riparian, and wetland vegetation	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal • Hydraulic modification	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-11: Grade and establish temporary and permanent storage areas for sediment, debris, and construction materials	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance	• Behavior modifications • Indirect effects from water quality changes or displacement and exposure
PA-12: Construct sediment-settling basins	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-13: Grade temporary access roads, traffic detours, and staging and work areas	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-14: Operate construction equipment and vehicles in the stream channel	• Equipment operation • Temporary ingress or egress • Hydraulic modification • Fish exclusion and handling	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-15: Construct temporary stream crossings	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal • Hydraulic modification • Fish exclusion and handling	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure

Table 7-1. Mechanisms of Impact and Potential Direct and Indirect Effects

Site-Specific Project	Potential Impact Mechanisms	Potential Direct Effects	Potential Indirect Effects
PA-16: Remove and disturb aquatic vegetation, stream sediment, and LWD	• Equipment operation • Excavation/fill • Temporary ingress or egress • Vegetation disturbance or removal • Hydraulic modification • Fish exclusion and handling	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-17: Install temporary cofferdams and diversion cofferdams	• Equipment operation • Excavation/fill • Blasting • Temporary ingress or egress • Hydraulic modification • Fish exclusion and handling	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-18: Temporarily redirect stream flow	• Equipment operation • Excavation/fill • Temporary ingress or egress • Vegetation disturbance or removal • Hydraulic modification • Fish exclusion and handling	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-19: Temporarily draft water from streams and other water bodies	• Equipment operation • Hydraulic modification • Fish exclusion and handling	• Water quality • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Indirect effects from water quality changes or displacement and exposure
PA-20: Install permanent and temporary RSP, sheet piles, and retaining walls	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal	• Water quality • Auditory, visual, or vibratory disturbance	• Indirect effects from water quality changes or displacement and exposure
PA-21: Place concrete and concrete slurry seal coat in cofferdams, footing and bridge forms	• Equipment operation	• Water quality • Auditory, visual, or vibratory disturbance	• Indirect effects from water quality changes or displacement and exposure
PA-22: Remove culverts	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal • Hydraulic modification • Fish exclusion and handling	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Indirect effects from water quality changes or displacement and exposure

Table 7-1. Mechanisms of Impact and Potential Direct and Indirect Effects

Site-Specific Project	Potential Impact Mechanisms	Potential Direct Effects	Potential Indirect Effects
PA-23: Clean, retrofit, or install culverts	• Equipment operation • Temporary ingress or egress • Vegetation Disturbance or removal • Hydraulic modification • Fish exclusion and handling	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-24: Install fishways or streams gradient control structures	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal • Hydraulic modification • Fish exclusion and handling	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-25: Remove existing bridge structure, including footings, piers, and piles	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal • Hydraulic modification • Fish exclusion and handling	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-26: Install bridge structures, excluding impact pile-driving	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal • Hydraulic modification • Fish exclusion and handling	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Behavior modifications • Indirect effects from water quality changes or displacement and exposure
PA-27: Blast rock and other substrate	• Equipment operation • Temporary ingress or egress • Vegetation disturbance or removal	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-28: Capture, handle, exclude, salvage, and relocate listed species	• Fish exclusion and handling	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance • Disturbance or injury	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure
PA-29: Implement BMPs	• Avoidance and minimization of direct impacts	• Water quality • Habitat modification • Auditory, visual, or vibratory disturbance	• Behavioral modifications • Indirect effects from water quality changes or displacement and exposure

7.2.1 Salmon and Steelhead

The effect determinations presented in this section are applicable for the following species and ESUs/DPSs, which are covered under this PBA.

Chinook Salmon

- California coastal ESU
- Sacramento River winter-run ESU
- Central Valley spring-run ESU

Coho Salmon

- Central California coast ESU
- Southern Oregon northern California coast ESU

Steelhead

- Northern California DPS
- Central California coast DPS
- California Central Valley DPS (migrates through the coverage area)

No Effect

The information and analysis presented in this PBA support the finding that an SSP warrants an effect determination of **No Effect** for salmon and steelhead (covered species) under the following circumstances.

A determination of **No Effect** is warranted based on the following rationale:

- Covered salmon and steelhead species do not occur within the defined project action area for the SSP and the PAs required to complete a specific SSP will not alter or modify habitat used by covered salmon and steelhead species.
- The SSP will occur in an ephemeral stream that may provide suitable habitat for salmon and steelhead, but PAs required to complete the SSP will occur when the stream channel is dry and covered salmon and steelhead species are not present, and the SSP will not require PAs that may alter or modify the habitat conditions in any substantial way.

Under certain circumstances and with application of all BMPs identified in this PBA (Appendix C), PAs that could be implemented as part of an SSP and result in a NE determination are discussed below.

- **PA-1: Operate construction equipment and vehicles.** This PA will have NE on salmon and steelhead if such equipment and vehicles operate on existing roadways; do not operate within active stream channels; are checked daily for leaks and faulty parts, and any such are repaired

or replaced immediately; and there is a Spill Prevention, Control, and Countermeasures (SPCC) Plan in place (BMP C.13.1, Appendix C).

- **PA-2: Use temporary lighting for night construction activities.** This PA will have NE on covered salmon and steelhead species if lighting is not located adjacent to surface waters occupied by salmon and steelhead or, if located near surface waters, the lighting is shielded such that it does not shine directly into the water and is focused on work areas (ABMP 2.3, Appendix C).
- **PA-3: Maintain and fuel construction equipment and vehicles.** This PA will have NE on covered salmon and steelhead species when all applicable BMPs and ABMPs are implemented (Appendix C).
- **PA-4: Clean roadway of sediment and debris during and following maintenance and construction activities.** This PA will have NE on covered salmon and steelhead species if sediment and debris are removed and disposed of at an appropriate facility and will not enter surface waters or affect habitat occupied by covered salmon or steelhead species and all applicable BMPs and ABMPs are implemented (Appendix C).
- **PA-5: Temporarily and permanently store sediment and debris and pavement, petroleum products, concrete, and other construction materials.** This PA will have NE on covered salmon and steelhead species only when the activity is temporary in nature; does not affect wetlands, wetland, or riparian vegetation; and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-6: Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure.** This PA will have NE on covered salmon and steelhead species when the activity is performed during the dry season, potential for these materials to be washed from the road surface does not exist, and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-8: Use drill rigs and drilling lubricants.** This PA will have NE on covered salmon and steelhead species when implemented in uplands or below the OHWL of a dry channel and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-9: Paint, wash, seal, and caulk bridges, guardrails, and other infrastructure.** This PA will have NE on covered species if implemented 50 feet or more from a surface water occupied by covered salmon and steelhead species and all applicable BMPs and ABMPs are employed (Appendix C).

Not Likely to Adversely Affect

The information and analysis presented in this PBA support the finding that under certain circumstances an SSP warrants a determination of **Not Likely to Adversely Affect** for salmon and steelhead (covered species). Such a determination may be appropriate under the following circumstances.

- Covered salmon and steelhead are documented as occurring in surface waters that may be affected during the implementation of an SSP and are known to occur within the project action area.

- An SSP will require in-water work and may affect habitat conditions for covered salmon and steelhead within the project action area.
- In-water work will occur during the appropriate in-water work window, which will minimize the number of covered salmon and steelhead and the life history stages that may be present within the project action area during implementation of an SSP.

A determination of **Not Likely to Adversely Affect** is warranted based on the following rationale for the following Pas.

- **PA-5: Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials.** This PA is Not Likely to Adversely Affect covered salmon and steelhead if the PA is permanent in nature and/or the storage area is located adjacent to surface waters that are occupied by covered salmon or steelhead or to wetlands or riparian vegetation and all applicable BMPs and ABMPs are employed (Appendix C)**.**
- **PA-6: Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure.** This PA is Not Likely to Adversely Affect covered salmon and steelhead if the activity is performed during the wet season, when potential for these materials to be washed from the road surface exists, and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-8: Use drill rigs and drilling lubricants.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented below the OHWL but above the wetted perimeter of any channel that is occupied by covered salmon and steelhead at some time of the year and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-9: Paint, wash, seal, and caulk bridges, guardrails, and other infrastructure.** This PA is Not Likely to Adversely Affect covered salmon and steelhead if implemented within 50 feet of a surface water occupied by covered salmon and steelhead, the channel is active, and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-10: Remove and disturb upland, riparian, and wetland vegetation.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when upland vegetation removal causes minor increases in turbidity but does not result in sedimentation; riparian vegetation is removed from no more than 500 linear feet of stream channel, and such removal may result in temporary increases in turbidity, but does not result in sedimentation or measurable increases in water temperature; removal of wetland vegetation does not measurably modify wetland functions and values; and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-11: Grade and establish temporary and permanent storage areas for sediment debris and construction materials.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when established in currently developed areas adjacent to surface waters occupied by covered salmon and steelhead or, if created, they are established away from surface waters or other sensitive habitats. Resulting increases in turbidity are temporary and do not result in sedimentation. All applicable BMPs and ABMPs will be employed to avoid and minimize potential impacts (Appendix C).

- **PA-12: Construct temporary sediment settling basins.** This PA is Not Likely to Adversely Affect covered salmon and steelhead by discharging some sediment-laden water to surface waters, which could increase turbidity. The purpose of a sediment settling basin is to trap sediments and reduce turbidity, thus any discharge of sediments to surface waters will reduce the discharge of sediments to surface waters, when compared to implementing an SSP without such a feature. Nevertheless, the increase in turbidity could affect the behavior of covered species.
- **PA-13: Grade temporary access roads, traffic detours, and staging and work areas.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented adjacent to surface waters occupied by covered species. Up to 1 acre of clearing may occur; however, any required clearing will be kept to the minimum necessary. Because the potential impacts are only temporary, no long-term or permanent impacts on covered species or their habitats are anticipated.
- **PA-14: Operate construction equipment and vehicles in the stream channel.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented in an isolated work area. Impacts from this PA associated with water quality, habitat modifications, and disturbance may result in changes in behavior of covered species, but will not result in injury or stress to covered species, as these species will be excluded from the in-water work area, where equipment will operate; (PA-28) will be implemented prior to any equipment operating in-water.
- **PA-15: Construct temporary stream crossings.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented in an isolated work area. PA-28 will be implemented prior to material being placed in-water to construct a temporary stream crossing; consequently, the area affected by a temporary stream crossing is isolated during installation. Additionally, these features are temporary, typically installed for a period of 1–2 months. Impacts associated with water quality, habitat modifications, and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area.
- **PA-16: Remove and disturb aquatic vegetation, stream sediment and Large Woody Debris.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented to remove invasive aquatic vegetation or LWD that is creating hydraulic forces that result, or could result, in erosion of stream banks or road prisms, undermining of bridges or culverts, damage to Caltrans-managed infrastructure. Impacts associated with water quality and disturbance will be temporary in nature. Habitat modifications associated with removal and disturbance of aquatic vegetation, stream sediments, and LWD will be more permanent in nature, but are intended to avoid potentially significant damage or catastrophic failure to infrastructure. This PA is considered a preventative measure to avoid potentially significant changes to habitat conditions, while maintaining functioning and secure infrastructure and minimizing impacts on covered species. Habitat modifications will cause changes in behavior, as changes in habitat will result in changes of how habitat is used.
- **PA-17: Install temporary cofferdams and diversion cofferdams.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented in accordance with the BMPs and ABMPs. Impacts associated with water quality, habitat modifications, and

disturbance will be temporary in nature and are not expected to generate any long-term or permanent impacts that could affect covered species. Additionally, the installation of cofferdams and diversion cofferdams will be implemented within an isolated work area, thereby avoiding potential stress or injury to covered species associated with this PA. PA-28 will be required to isolate the in-water work area prior to implementing this PA.

- **PA-18: Temporarily redirect stream flow.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented, as impacts related to water quality, habitat modification, and disturbance will be temporary, and measures to avoid and minimize these impacts will be implemented as part of the PA. Impacts associated with water quality such as increased turbidity and changes in water temperature will be localized and temporary and are not anticipated to have any measurable impact on covered species. The outlets of temporary diversions will not result in channel or bank erosion. Changes in hydraulics associated with a temporary diversion will be temporary in nature and should not result in measurable changes in channel morphology or habitat conditions.
- **PA-19: Temporarily draft water from streams and other water bodies.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented with an appropriate screen to avoid fish entrainment and substrate scour. Additionally, the amount of water, or rate of water, is such that impacts on the surface waters are not anticipated to be considerable as the amount and/or rate of water drafted is small in relation to the amount/flow of the water body from which water is drafted. The drafting of water can cause disturbance to covered species, however, as fish may move out of areas where temporary drafting activities occur. No more than 10% of flows above the diversion will be drafted.
- **PA-20: Install permanent and temporary RSP, sheet piles, and retaining walls.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented in an isolated work area. PA-28 will be implemented prior to material being placed in-water to stabilize stream banks, thus the area affected by installing permanent and temporary RSP is isolated during installation. Additionally, these features are temporary, typically installed for a period of one to two months. Impacts associated with water quality, habitat modifications and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area.
- **PA-21: Place concrete and concrete slurry seal coat in cofferdams, footing and bridge forms.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented in an isolated work area. PA-28 will be implemented prior to material being placed in-water, thus isolating the area affected by a temporary stream crossing during installation. Disturbance of species affected by work within an active channel is likely as work occurs in an isolated portion of the active channel. Impacts associated with water quality and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area.
- **PA-22: Remove culverts.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented in an isolated work area. PA-28 will be implemented prior to removal of culverts, thus isolating the area affected by removing culverts during construction. Disturbance to covered species associated with culvert removal includes avoidance of the work area and stream segments adjacent to the work area. Impacts

associated with water quality, habitat modifications, and disturbance, such as avoidance of the work area, will be temporary in nature and may result in behavioral changes for the species. Additionally, removal of barrier culverts will provide fish passage and access to habitat previous inaccessible, a beneficial aspect of this PA.

- **PA-23: Clean, retrofit, or install culverts.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented in an isolated work area. PA-28 will be implemented prior to the retrofitting or installation of culverts, thus isolating the area affected by this PA during construction. Disturbance to covered species associated with cleaning, retrofitting, and installing culverts includes avoidance of the work area and stream segments adjacent to the work area. Impacts associated with water quality, habitat modifications, and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area. Additionally, installation of a culvert that replaces a barrier culvert (removed as part of PA-23) will provide access to previously inaccessible habitat, a beneficial aspect of this PA.
- **PA-24: Install fishways or stream gradient control structures.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented in an isolated work area. PA-28 will be implemented prior to the installation of fishways or stream gradient control structures, thus isolating the area affected by this PA during construction. Disturbance to covered species associated with installing fishways and gradient control structures includes avoidance of the work area and stream segments adjacent to the work area. Impacts associated with water quality and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area. Installation of fishways and grade control structures will modify habitat conditions for covered species; however, these habitat modifications are intended to be beneficial and provide fish passage where fish passage may not currently exist, or to improve fish passage where partial passage may currently exist. These structures may be installed to retard channel scour or bank erosion, which will also improve fish habitat conditions.
- **PA-25: Remove existing bridge structure, including footings, piers, and piles.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented in an isolated work area. PA-28 will be implemented prior to removal of any bridge structure, thus the area affected by removing such structure is isolated during construction. Impacts associated with water quality and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area. Removal of bridge structures will modify habitat conditions for covered species, however these habitat modifications are anticipated to be unmeasurable, as removed bridge structures will likely be replaced (PA-26) with a similar size and type of structure. Bridge structures that are removed from below the OHWL and not replaced will have a beneficial impact as the channel dynamics will be natural and unimpeded by an artificial structure.
- **PA-26: Install bridge structures, excluding impact pile driving.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented in an isolated work area. PA-28 will be implemented prior to installation of any bridge structure, thus isolating the area affected by installing such structures during construction. Impacts associated with water quality and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area. Installation of bridge structures will modify

habitat conditions for covered species; however, these habitat modifications are relatively minor, as the installed structures will be replacing structures removed per PA-25, or replacing culverts removed per PA-22. Installing a bridge structure to replace a culvert will improve habitat conditions for covered salmon and steelhead.

- **PA-27: Blast rock and other substrate.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented at a distance at least twice the set-back distances outlined in Chapter 6 (Table 6.2). Blasting at a distance twice the setback distances outlined in Chapter 6 will ensure that adverse impacts associated with compressive shock waves and potential harassment will be avoided.
- **PA-29: Implement BMPs.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when BMPs developed and implemented result in disturbance, such as installation of outlet protection and velocity dissipation devices being installed adjacent to waters occupied by covered species or when a PA requires BMPs associated with material and equipment use over water, which may cause behavioral changes in covered species.
- **PA-30: Mitigation framework for potential adverse impacts on species listed under CESA.** This PA is Not Likely to Adversely Affect covered salmon and steelhead when implemented in streams during periods when covered species are not present in the stream, but modifies habitat conditions within portions of streams that covered species do occupy during part of the year.

General criteria applicable to a **Not Likely to Adversely Affect** determination for covered salmon and steelhead are listed below.

- The in-water work associated with the covered activities may increase turbidity to levels that may limit foraging success of covered salmon and steelhead. However, increases in turbidity will be of short duration, and covered salmon and steelhead that may occur within the defined project action area will be able to avoid areas with increased turbidity. Increases in turbidity are not expected to become elevated to a point that may harm or injure a fish.
- None of these activities require fish exclusion or handling.
- None of these activities will produce elevated underwater noise levels that could result in injury or be considered harassment.
- None of these activities are expected to result in the release of hazardous materials.
- Disturbance to the prey base of the covered salmon and steelhead from these activities is expected to be temporary and at such a small scale as to be insignificant or discountable.

Likely to Adversely Affect

The information and analysis presented in this PBA support the finding that under certain circumstances an SSP warrants a determination of **Likely to Adversely Affect** for salmon and steelhead (covered species). Such a determination may be appropriate under the following circumstances.

- Covered salmon and steelhead are documented as occurring in surface waters that may be affected during the implementation of an SSP and are known to occur within the project action area.
- An SSP will require in-water work and may affect habitat conditions for covered salmon and steelhead within the project action area.

A determination of **Likely to Adversely Affect** is warranted for the activities indicated below based on the following rationale.

- **PA-27: Blast rock and other substrate.** The blasting of rock and other substrate (PA-27) can cause increases in noise and pressure waves that can adversely affect fish. A rapid decrease in ambient hydrostatic pressure in the range of 100 kPa resulting from the detonation of an explosive charge will have an adverse affect on covered salmon and steelhead. The adherence to the setback distances outlined in Table 6.2 in Chapter 6 will avoid potential injury or mortality associated with PA-27, however potential adverse impacts (harassment) may still result from blasting activities that adhere to these setback guidelines.
- **PA-28: Capture, handle, exclude, salvage, and relocate listed species.** The exclusion, capture, handling, and release of covered juvenile salmon and steelhead from a stream in order to isolate an in-water work area to complete an SSP will put the fish as risk of physical bodily injury as well as increased stress associated with handling the fish. PA-28 may be required to complete eight SSPs covered under this PBA, however PA-28 will not be required each time one of these SSPs is implemented. However, when PA-28 is implemented it will likely have an adverse affect on covered salmon and steelhead species.

7.2.2 Covered Salmon and Steelhead Designated Critical Habitat

The information and analysis presented in this PBA support the finding that this project warrants a determination of **Not Likely to Adversely Affect** for designated critical habitat for the covered salmon ESUs and steelhead DPSs indicated under Section 7.2.1 (critical habitat has been designated for all of the salmon and steelhead ESUs/DPSs covered under this PBA). This determination is warranted based on the following rationales.

- Critical habitat has been designated for the covered salmon and steelhead within the defined project action area for the covered activities.
- The covered activities will involve in-water work and modification of habitat conditions for the covered salmon and steelhead.
- The covered activities will require in-water work, which will modify designated critical habitat but will maintain habitat conditions at a functional condition necessary to meet conservation needs for covered salmon and steelhead.
- The PAs required to implement an SSP will cause a temporary degradation of habitat conditions (e.g., increased turbidity), but overall the covered activities will maintain the environmental baseline conditions and not degrade the PCEs that define critical habitat.
- The PAs will not destroy or adversely modify critical habitat when implemented to complete an SSP, although some SSPs will result in a permanent impact (e.g., culvert replacement with

a bridge), they will in many instances result in an improvement to the environmental baseline and will not degrade the PCEs to an extent that impairs the conservation value of designated critical habitat in the defined project action area.

- Some SSPs will improve the environmental baseline or the PCEs, thereby affecting the existing condition (e.g., SSP-3.4 may improve fish passage and/or sediment transport).

- the implementation of an SSP and are known to occur within the project action area.
- An SSP will require in-water work and may affect habitat conditions for green sturgeon within the project action area.

7.2.3 A Green Sturgeon (Southern DPS)

The effect determinations presented in this section vary and are applicable based on the rationale outlined below.

No Effect

The information and analysis presented in this PBA support the finding that an SSP warrants an effect determination of **No Effect** on green sturgeon under the following circumstances.

- Green sturgeon do not occur within the defined project action area for the SSP and the PAs required to complete a specific SSP will not alter or modify habitat used by green sturgeon.
- The SSP will occur in a stream that does not provide suitable habitat for green sturgeon.

Under certain circumstances and with application of all BMPs identified in this PBA (Appendix C), PAs that could be implemented as part of an SSP and result in a NE determination are summarized below.

- **PA-1: Operate construction equipment and vehicles.** This PA will have NE on green sturgeon if equipment and vehicles operate on existing roadways; do not operate within active stream channels; are checked daily for leaks and faulty parts, and any such are repaired or replaced immediately; and there is a Spill Prevention, Control, and Countermeasures (SPCC) Plan in place (BMP C.13.1, Appendix C).
- **PA-2: Use temporary lighting for night construction activities.** This PA will have NE on green sturgeon if lighting is not located adjacent to surface waters occupied by green sturgeon or, if it is located near surface waters, the lighting is shielded such that it does not shine directly into the water and is focused on work areas (ABMP 2.3, Appendix C).
- **PA-3: Maintain and fuel construction equipment and vehicles.** This PA will have NE on green sturgeon when all applicable BMPs and ABMPs are implemented (Appendix C)
- **PA-4: Clean roadway of sediment and debris during and following maintenance and construction activities.** This PA will have NE on green sturgeon if sediment and debris are removed and disposed of at an appropriate facility and will not enter surface waters or affect habitat occupied by green sturgeon and all applicable BMPs and ABMPs are implemented (Appendix C).

- **PA-5: Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials.** This PA will have NE on green sturgeon when the activity does not occur adjacent to suitable green sturgeon habitat, does not affect wetland or riparian vegetation adjacent to green sturgeon habitat, and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-6: Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure.** This PA will have NE on green sturgeon when the activity is performed during the dry season, potential for these materials to be washed from the road surface does not exist, and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-8: Use drill rigs and drilling lubricants.** This PA will have NE on green sturgeon when implemented in uplands or below the OHWL of a dry channel and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-9: Paint, wash, seal, and caulk bridges, guardrails, and other infrastructure.** This PA will have NE on green sturgeon if implemented 50 feet or more from a surface water occupied by green sturgeon and all applicable BMPs and ABMPs are employed (Appendix C).

Not Likely to Adversely Affect

The information and analysis presented in this PBA support the finding that under certain circumstances an SSP warrants a determination of **Not Likely to Adversely Affect** for green sturgeon. Such a determination may be appropriate under the following circumstances.

- Green sturgeon are documented as occurring in surface waters that may be affected during the implementation of an SSP and are known to occur within the project action area.
- An SSP will require in-water work and may affect habitat conditions for green sturgeon within the project action area.
- In-water work will occur during the appropriate in-water work window, which will minimize the number of green sturgeon and the life history stages that may be present within the project action area during implementation of an SSP.

A determination of **Not Likely to Adversely Affect** is warranted based on the following rationale for the following Pas.

- **PA-5: Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials.** This PA is Not Likely to Adversely Affect green sturgeon if the PA is permanent in nature and/or the storage area is located adjacent to surface waters that are occupied by green sturgeon green sturgeon or to wetlands or riparian vegetation and all applicable BMPs and ABMPs are employed (Appendix C)**.**
- **PA-6: Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure.** This PA is Not Likely to Adversely Affect green sturgeon if the activity is performed during the wet season, when

potential for these materials to be washed from the road surface exists, and all applicable BMPs and ABMPs are employed (Appendix C).

- **PA-8: Use drill rigs and drilling lubricants.** This PA is Not Likely to Adversely Affect green sturgeon when implemented below the OHWL but above the wetted perimeter of any channel that is occupied by green sturgeon at some time of the year and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-9: Paint, wash, seal, and caulk bridges, guardrails, and other infrastructure.** This PA is Not Likely to Adversely Affect green sturgeon if implemented within 50 feet of a surface water occupied by green sturgeon, the channel is active, and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-10: Remove and disturb upland, riparian, and wetland vegetation.** This PA is Not Likely to Adversely Affect green sturgeon when upland vegetation removal causes minor increases in turbidity but does not result in sedimentation; riparian vegetation is removed from no more than 500 linear feet of stream channel, and such removal may result in temporary increases in turbidity, but does not result in sedimentation or measurable increases in water temperature; removal of wetland vegetation does not measurably modify wetland functions and values; and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-11: Grade and establish temporary and permanent storage areas for sediment debris and construction materials.** This PA is Not Likely to Adversely Affect green sturgeon when established in currently developed areas adjacent to surface waters occupied by green sturgeon or, if created, they are established away from surface waters or other sensitive habitats. Resulting increases in turbidity are temporary and do not result in sedimentation. All applicable BMPs and ABMPs will be employed to avoid and minimize potential impacts (Appendix C).
- **PA-12: Construct temporary sediment settling basins.** This PA is Not Likely to Adversely Affect green sturgeon by discharging some sediment-laden water to surface waters, which could increase turbidity. The purpose of a sediment settling basin is to trap sediments and reduce turbidity, thus any discharge of sediments to surface waters will reduce the discharge of sediments to surface waters, when compared to implementing an SSP without such a feature. Nevertheless, the increase in turbidity could affect the behavior of green sturgeon.
- **PA-13: Grade temporary access roads, traffic detours, and staging and work areas.** This PA is Not Likely to Adversely Affect green sturgeon when implemented adjacent to surface waters occupied by green sturgeon. Up to 1 acre of clearing may occur; however, any required clearing will be kept to the minimum necessary. Because the potential impacts are only temporary, no long-term or permanent impacts on green sturgeon or its habitat are anticipated.
- **PA-14: Operate construction equipment and vehicles in the stream channel.** This PA is Not Likely to Adversely Affect green sturgeon when implemented in an isolated work area. Impacts from this PA associated with water quality, habitat modifications, and disturbance may result in changes in behavior of green sturgeon, but will not result in injury or stress to the species, as sturgeon will be excluded from the in-water work area, where equipment will operate; (PA-28) will be implemented prior to any equipment operating in-water.

- **PA-15: Construct temporary stream crossings.** This PA is Not Likely to Adversely Affect green sturgeon when implemented in an isolated work area. PA-28 will be implemented prior to material being placed in-water to construct a temporary stream crossing; consequently, the area affected by a temporary stream crossing is isolated during installation. Additionally, these features are temporary, typically installed for a period of 1–2 months. Impacts associated with water quality, habitat modifications, and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area.
- **PA-16: Remove and disturb aquatic vegetation, stream sediment and Large Woody Debris.** This PA is Not Likely to Adversely Affect green sturgeon when implemented to remove invasive aquatic vegetation or LWD that is creating hydraulic forces that result, or could result, in erosion of stream banks or road prisms, undermining of bridges or culverts, or damage to Caltrans-managed infrastructure. Impacts associated with water quality and disturbance will be temporary in nature. Habitat modifications associated with removal and disturbance of aquatic vegetation, stream sediments, and LWD will be more permanent in nature, but are intended to avoid potentially significant damage or catastrophic failure to infrastructure. This PA is considered a preventative measure to avoid potentially significant changes to habitat conditions, while maintaining functioning and secure infrastructure and minimizing impacts to covered species. Habitat modifications may cause changes in behavior, as changes in habitat will result in changes of how habitat is used. However, impacts associated with this PA are not anticipated to affect green sturgeon to a measurable extent because green sturgeon in fresh water and estuaries tend to occupy deeper water than will generally be affected by this PA.
- **PA-17: Install temporary cofferdams and diversion cofferdams.** This PA is Not Likely to Adversely Affect green sturgeon when implemented in accordance with the BMPs and ABMPs. Impacts associated with water quality, habitat modifications, and disturbance will be temporary in nature and are not expected to generate any long-term or permanent impacts that could affect green sturgeon. Additionally, the installation of cofferdams and diversion cofferdams will be implemented within an isolated work area, thereby avoiding potential stress or injury to green sturgeon associated with this PA. PA-28 will be required to isolate the in-water work area prior to implementing this PA.
- **PA-18: Temporarily redirect stream flow.** This PA is Not Likely to Adversely Affect green sturgeon when implemented, as impacts related to water quality, habitat modification, and disturbance will be temporary, and measures to avoid and minimize these impacts will be implemented as part of the PA. Impacts associated with water quality such as increased turbidity and changes in water temperature will be localized and temporary and are not anticipated to have any measurable impact on green sturgeon. The outlets of temporary diversions will not result in channel or bank erosion. Changes in hydraulics associated with a temporary diversion will be temporary in nature and should not result in measurable changes in channel morphology or habitat conditions.
- **PA-19: Temporarily draft water from streams and other water bodies.** This PA is Not Likely to Adversely Affect green sturgeon when implemented with an appropriate screen to avoid fish entrainment and substrate scour. Additionally, the amount or rate of water is such that impacts on the surface waters are not anticipated to be measurable as the amount and/or

rate of water drafted is small in relation to the amount/flow of the water body from which water is drafted. The drafting of water can cause disturbance to green sturgeon, however, as fish may move out of areas where temporary drafting activities occur.

- **PA-20: Install permanent and temporary RSP, sheet piles, and retaining walls.** This PA is Not Likely to Adversely Affect green sturgeon when implemented in an isolated work area. PA-28 will be implemented prior to material being placed in-water to stabilize stream banks, thus the area affected by installing permanent and temporary RSP is isolated during installation. Additionally, these features are temporary, typically installed for a period of 1–2 months. Impacts associated with water quality, habitat modifications, and disturbance will be temporary in nature and may result in behavioral changes to green sturgeon, such as avoidance of the work area.
- **PA-21: Place concrete and concrete slurry seal coat in cofferdams, footing and bridge forms.** This PA is Not Likely to Adversely Affect green sturgeon when implemented in an isolated work area. PA-28 will be implemented prior to material being placed in-water, thus isolating the area affected by a temporary stream crossing during installation. Disturbance of species affected by work within an active channel is likely as work occurs in an isolated portion of the active channel. Impacts associated with water quality and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area.
- **PA-22: Remove culverts.** This PA is Not Likely to Adversely Affect green sturgeon when implemented in an isolated work area. PA-28 will be implemented prior to removal of culverts, thus isolating the area affected by removing culverts during construction. Disturbance to green sturgeon associated with culvert removal includes avoidance of the work area and stream segments adjacent to the work area. Impacts associated with water quality, habitat modifications, and disturbance, such as avoidance of the work area, will be temporary in nature and may result in behavioral changes for the species. Additionally, removal of barrier culverts will provide fish passage and access to habitat previous inaccessible, a beneficial aspect of this PA. Culverts typically removed as part of this PA are associated with water bodies generally not occupied by green sturgeon; however, from time to time the PA may be implemented in waters that may be occupied by green sturgeon.
- **PA-23: Clean, retrofit, or install culverts.** This PA is Not Likely to Adversely Affect green sturgeon when implemented in an isolated work area. PA-28 will be implemented prior to the retrofitting or installation of culverts, thus isolating the area affected by this PA during construction. Disturbance to green sturgeon associated with cleaning, retrofitting, and installing culverts includes avoidance of the work area and stream segments adjacent to the work area. Impacts associated with water quality, habitat modifications, and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area. Additionally, installation of a culvert that replaces a barrier culvert (removed as part of PA-23) will provide access to previously inaccessible habitat, a beneficial aspect of this PA. Culverts typically removed as part of this PA are associated with water bodies generally not occupied by green sturgeon; however, from time to time the PA may be implemented in waters that may be occupied by green sturgeon.

- **PA-24: Install fishways or stream gradient control structures.** This PA is Not Likely to Adversely Affect green sturgeon when implemented in an isolated work area. PA-28 will be implemented prior to the installation of fishways or stream gradient control structures, thus isolating the area affected by this PA during construction. Disturbance to green sturgeon associated with installing fishways and gradient control structures includes avoidance of the work area and stream segments adjacent to the work area. Impacts associated with water quality and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area. Installation of fishways and grade control structures will modify habitat conditions for green sturgeon; however, these habitat modifications are intended to be beneficial and provide fish passage where fish passage may not currently exist, or to improve fish passage where partial passage may currently exist. These structures may be installed to retard channel scour or bank erosion, which will also improve fish habitat conditions. However, these habitat modifications will generally occur in waters not occupied by green sturgeon; nevertheless, from time to time the PA may be implemented in waters that may be occupied by green sturgeon.
- **PA-25: Remove existing bridge structure, including footings, piers, and piles.** This PA is Not Likely to Adversely Affect green sturgeon when implemented in an isolated work area. PA-28 will be implemented prior to removal of any bridge structure, thus the area affected by removing such structure is isolated during construction. Impacts associated with water quality and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area. Removal of bridge structures will modify habitat conditions for green sturgeon; however, these habitat modifications are anticipated to be unmeasurable, as removed bridge structures will likely be replaced (PA-26) with a similar size and type of structure. Bridge structures that are removed from below the OHWL and not replaced will have a beneficial impact as the channel dynamics will be natural and unimpeded by an artificial structure.
- **PA-26: Install bridge structures, excluding impact pile driving.** This PA is Not Likely to Adversely Affect green sturgeon when implemented in an isolated work area. PA-28 will be implemented prior to installation of any bridge structure, thus isolating the area affected by installing such structures during construction. Impacts associated with water quality and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area. Installation of bridge structures will modify habitat conditions for green sturgeon; however, these habitat modifications are relatively minor, as the installed structures will be replacing structures removed per PA-25, or replacing culverts removed per PA-22. Installing a bridge structure to replace a culvert will improve habitat conditions for green sturgeon.
- **PA-27: Blast rock and other substrate.** This PA is Not Likely to Adversely Affect green sturgeon when implemented at a distance at least twice the set-back distances outlined in Chapter 6 (Table 6.2). Blasting at a distance twice the setback distances outlined in Chapter 6 will ensure that adverse impacts associated with compressive shock waves and potential harassment will be avoided.
- **PA-29: Implement BMPs.** This PA is Not Likely to Adversely Affect green sturgeon when BMPs developed and implemented result in disturbance, such as installation of outlet protection and velocity dissipation devices being installed adjacent to waters occupied by

covered species or when a PA requires BMPs associated with material and equipment use over water, which may cause behavioral changes in green sturgeon.

- **PA-30: Mitigation framework for potential adverse impacts on species listed under CESA.** This PA is Not Likely to Adversely Affect green sturgeon when implemented in streams during periods when covered species are not present in the stream, but modifies habitat conditions within portions of streams that covered species do occupy during part of the year.

General criteria applicable to a Not Likely to Adversely Affect determination for green sturgeon are listed below.

- The in-water work associated with the covered activities may increase turbidity to levels that may limit foraging success of green sturgeon. However, increases in turbidity will be of a short duration, and green sturgeon that may occur within the defined project action area will be able to avoid areas with increased turbidity. Increases in turbidity are not expected to become elevated to a point that may harm or injure a fish.
- None of these activities require fish exclusion or handling.
- None of these activities will produce elevated underwater noise levels that could result in injury.
- The SSPs/PAs do not result in the release of hazardous materials.
- Disturbance to prey base from these activities is expected to be temporary and at such a small scale as to be insignificant and discountable.

Likely to Adversely Affect

The information and analysis presented in this PBA support the finding that under certain circumstances an SSP warrants a determination of **Likely to Adversely Affect** for green sturgeon. Such a determination may be appropriate under the following circumstances.

Green sturgeon are documented as occurring in surface waters that may be affected during determination of **Likely to Adversely Affect** is warranted for the activities indicated below based on the following rationale.

- **PA-27: Blast rock and other substrate.** The blasting of rock and other substrate (PA-27) can cause increases in noise and pressure waves that can adversely affect fish. A rapid decrease in ambient hydrostatic pressure in the range of 100 kPa resulting from the detonation of an explosive charge may have an adverse affect on green sturgeon similar to the effect on covered salmon and steelhead. The adherence to the setback distances outlined in Table 6.2 in Chapter 6 will avoid potential injury or mortality associated with PA-27, however potential adverse impacts (harassment) may still result from blasting activities that adhere to these setback guidelines.
- **PA-28: Capture, handle, exclude, salvage, and relocate listed species.** The exclusion, capture, handling, and release of green sturgeon from a stream in order to isolate an in-water work area to complete an SSP will put the fish as risk of physical bodily injury as well as

increased stress associated with handling the fish. PA-28 may be required to complete eight SSPs covered under this PBA, however PA-28 will not be required each time one of these SSPs is implemented. However, when PA-28 is implemented it will likely have an adverse affect on green sturgeon.

Critical Habitat

Critical habitat was proposed for the southern DPS of green sturgeon on September 8, 2008 (73 FR 52084). Proposed critical habitat includes marine and estuarine waters adjacent to the coverage area. The covered activities presented in this PBA Will Not Adversely Modify proposed green sturgeon critical habitat.

A determination of Will Not Adversely Modify proposed critical habitat for the southern DPS of green sturgeon is warranted based on the following rationale:

- Anticipated impacts on habitat within the coverage area will affect non-suitable green sturgeon habitat.
- The conservation role of the habitat for the species will not be altered by the covered activities.
- The covered activities will not reduce the quantity of proposed critical habitat.

If critical habitat for the southern DPS of green sturgeon is designated during the life of this PBA, a provisional effect determination for critical habitat is provided: The covered activities are Not Likely to Adversely Affect designated critical habitat of the southern DPS of green sturgeon.

A determination of **Not Likely to Adversely Affect** is warranted based on the following rationale:

- Critical habitat for green sturgeon has been designated within the defined project action area for the covered activities.
- The covered activities will involve in-water work that could affect habitat conditions for the green sturgeon.
- The covered activities will require in-water work, which could affect critical habitat but will maintain habitat conditions at a functional condition necessary to meet conservation needs for green sturgeon.
- The PAs required to implement an SSP may cause a temporary degradation of habitat conditions (e.g., increased turbidity) but overall the covered activities will maintain the environmental baseline conditions and not degrade critical habitat.
- The PAs will not destroy or adversely modify critical habitat when implemented to complete an SSP, although some SSPs will result in a permanent impact (i.e. culvert replacement with a bridge) they will in many instances result in an improvement to the environmental baseline and will not degrade habitat conditions to an extent that impairs the conservation value of critical habitat in the defined project action area.

7.2.4 Eulachon

The effect determinations presented in this section vary and are applicable based on the rationale outlined below.

No Effect

The information and analysis presented in this PBA support the finding that an SSP warrants an effect determination of **No Effect** on eulachon under the following circumstances.

- Eulachon do not occur within the defined project action area for the SSP and the PAs required to complete a specific SSP will not alter or modify habitat used by eulachon.
- The SSP will occur in a stream that does not provide suitable habitat for eulachon.

Under certain circumstances and with application of all BMPs identified in this PBA (Appendix C), PAs that could be implemented as part of an SSP and result in a NE determination are summarized below.

- **PA-1: Operate construction equipment and vehicles.** This PA will have NE on eulachon if equipment and vehicles operate on existing roadways; do not operate within active stream channels; are checked daily for leaks and faulty parts, and any such are repaired or replaced immediately; and there is a Spill Prevention, Control, and Countermeasures (SPCC) Plan in place (BMP C.13.1, Appendix C).
- **PA-2: Use temporary lighting for night construction activities.** This PA will have NE on eulachon if lighting is not located adjacent to surface waters occupied by eulachon or, if it is located near surface waters, the lighting is shielded such that it does not shine directly into the water and is focused on work areas (ABMP 2.3, Appendix C).
- **PA-3: Maintain and fuel construction equipment and vehicles.** This PA will have NE on eulachon when all applicable BMPs and ABMPs are implemented (Appendix C)
- **PA-4: Clean roadway of sediment and debris during and following maintenance and construction activities.** This PA will have NE on eulachon if sediment and debris are removed and disposed of at an appropriate facility and will not enter surface waters or affect habitat occupied by eulachon and all applicable BMPs and ABMPs are implemented (Appendix C).
- **PA-5: Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials.** This PA will have NE on green sturgeon when the activity does not occur adjacent to suitable eulachon habitat, does not affect wetland or riparian vegetation adjacent to eulachon habitat, and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-6: Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure.** This PA will have NE on eulachon when the activity is performed during the dry season, potential for these materials to be washed from the road surface does not exist, and all applicable BMPs and ABMPs are employed (Appendix C).

- **PA-8: Use drill rigs and drilling lubricants.** This PA will have NE on eulachon when implemented in uplands or below the OHWL of a dry channel and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-9: Paint, wash, seal, and caulk bridges, guardrails, and other infrastructure.** This PA will have NE on eulachon if implemented 50 feet or more from a surface water occupied by eulachon and all applicable BMPs and ABMPs are employed (Appendix C).

Not Likely to Adversely Affect

The information and analysis presented in this PBA support the finding that under certain circumstances an SSP warrants a determination of **Not Likely to Adversely Affect** for eulachon. Such a determination may be appropriate under the following circumstances.

- Eulachon are documented as occurring in surface waters that may be affected during the implementation of an SSP and are known to occur within the project action area.
- An SSP will require in-water work and may affect habitat conditions for eulachon within the project action area.
- In-water work will occur during the appropriate in-water work window, which will minimize the number of eulachon and the life history stages that may be present within the project action area during implementation of an SSP.

A determination of **Not Likely to Adversely Affect** is warranted based on the following rationale for the following PAs.

- **PA-5: Temporarily and permanently store sediment and debris, and pavement, petroleum products, concrete, and other construction materials.** This PA is Not Likely to Adversely Affect eulachon if the PA is permanent in nature and/or the storage area is located adjacent to surface waters that are occupied by eulachon or to wetlands or riparian vegetation and all applicable BMPs and ABMPs are employed (Appendix C)**.**
- **PA-6: Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure.** This PA is Not Likely to Adversely Affect eulachon if the activity is performed during the wet season, when potential for these materials to be washed from the road surface exists, and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-8: Use drill rigs and drilling lubricants.** This PA is Not Likely to Adversely Affect eulachon when implemented below the OHWL but above the wetted perimeter of any channel that is occupied by eulachon at some time of the year and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-9: Paint, wash, seal, and caulk bridges, guardrails, and other infrastructure.** This PA is Not Likely to Adversely Affect eulachon if implemented within 50 feet of a surface water occupied by eulachon, the channel is active, and all applicable BMPs and ABMPs are employed (Appendix C).

- **PA-10: Remove and disturb upland, riparian, and wetland vegetation.** This PA is Not Likely to Adversely Affect eulachon when upland vegetation removal causes minor increases in turbidity but does not result in sedimentation; riparian vegetation is removed from no more than 500 linear feet of stream channel, and such removal may result in temporary increases in turbidity, but does not result in sedimentation or measurable increases in water temperature; removal of wetland vegetation does not measurably modify wetland functions and values; and all applicable BMPs and ABMPs are employed (Appendix C).
- **PA-11: Grade and establish temporary and permanent storage areas for sediment debris and construction materials.** This PA is Not Likely to Adversely Affect eulachon when established in currently developed areas adjacent to surface waters occupied by eulachon or, if created, they are established away from surface waters or other sensitive habitats. Resulting increases in turbidity are temporary and do not result in sedimentation. All applicable BMPs and ABMPs will be employed to avoid and minimize potential impacts (Appendix C).
- **PA-12: Construct temporary sediment settling basins.** This PA is Not Likely to Adversely Affect eulachon by discharging some sediment-laden water to surface waters, which could increase turbidity. The purpose of a sediment settling basin is to trap sediments and reduce turbidity, thus any discharge of sediments to surface waters will reduce the discharge of sediments to surface waters, when compared to implementing an SSP without such a feature. Nevertheless, the increase in turbidity could affect the behavior of eulachon.
- **PA-13: Grade temporary access roads, traffic detours, and staging and work areas.** This PA is Not Likely to Adversely Affect green sturgeon when implemented adjacent to surface waters occupied by eulachon. Up to 1 acre of clearing may occur; however, any required clearing will be kept to the minimum necessary. Because the potential impacts are only temporary, no long-term or permanent impacts on eulachon or its habitat are anticipated.
- **PA-14: Operate construction equipment and vehicles in the stream channel.** This PA is Not Likely to Adversely Affect eulachon when implemented in an isolated work area. Impacts from this PA associated with water quality, habitat modifications, and disturbance may result in changes in behavior of eulachon, but will not result in injury or stress to the species, as eulachon will be excluded from the in-water work area, where equipment will operate; (PA-28) will be implemented prior to any equipment operating in-water.
- **PA-15: Construct temporary stream crossings.** This PA is Not Likely to Adversely Affect eulachon when implemented in an isolated work area. PA-28 will be implemented prior to material being placed in-water to construct a temporary stream crossing; consequently, the area affected by a temporary stream crossing is isolated during installation. Additionally, these features are temporary, typically installed for a period of 1–2 months. Impacts associated with water quality, habitat modifications, and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area.
- **PA-16: Remove and disturb aquatic vegetation, stream sediment and Large Woody Debris.** This PA is Not Likely to Adversely Affect eulachon when implemented to remove invasive aquatic vegetation or LWD that is creating hydraulic forces that result, or could result, in erosion of stream banks or road prisms, undermining of bridges or culverts, or damage to Caltrans-managed infrastructure. Impacts associated with water quality and disturbance will be temporary in nature. Habitat modifications associated with removal and disturbance of aquatic

vegetation, stream sediments, and LWD will be more permanent in nature, but are intended to avoid potentially significant damage or catastrophic failure to infrastructure. This PA is considered a preventative measure to avoid potentially significant changes to habitat conditions, while maintaining functioning and secure infrastructure and minimizing impacts to covered species. Habitat modifications may cause changes in behavior, as changes in habitat will result in changes of how habitat is used. However, impacts associated with this PA are not anticipated to affect eulachon to a measurable extent because eulachon in fresh water and estuaries tend to occupy deeper water than will generally be affected by this PA.

- **PA-17: Install temporary cofferdams and diversion cofferdams.** This PA is Not Likely to Adversely Affect eulachon when implemented in accordance with the BMPs and ABMPs. Impacts associated with water quality, habitat modifications, and disturbance will be temporary in nature and are not expected to generate any long-term or permanent impacts that could affect eulachon. Additionally, the installation of cofferdams and diversion cofferdams will be implemented within an isolated work area, thereby avoiding potential stress or injury to eulachon associated with this PA. PA-28 will be required to isolate the in-water work area prior to implementing this PA.
- **PA-18: Temporarily redirect stream flow.** This PA is Not Likely to Adversely Affect eulachon when implemented, as impacts related to water quality, habitat modification, and disturbance will be temporary, and measures to avoid and minimize these impacts will be implemented as part of the PA. Impacts associated with water quality such as increased turbidity and changes in water temperature will be localized and temporary and are not anticipated to have any measurable impact on green sturgeon. The outlets of temporary diversions will not result in channel or bank erosion. Changes in hydraulics associated with a temporary diversion will be temporary in nature and should not result in measurable changes in channel morphology or habitat conditions.
- **PA-19: Temporarily draft water from streams and other water bodies.** This PA is Not Likely to Adversely Affect eulachon when implemented with an appropriate screen to avoid fish entrainment and substrate scour. Additionally, the amount or rate of water is such that impacts on the surface waters are not anticipated to be measurable as the amount and/or rate of water drafted is small in relation to the amount/flow of the water body from which water is drafted. The drafting of water can cause disturbance to eulachon, however, as fish may move out of areas where temporary drafting activities occur.
- **PA-20: Install permanent and temporary RSP, sheet piles, and retaining walls.** This PA is Not Likely to Adversely Affect eulachon when implemented in an isolated work area. PA-28 will be implemented prior to material being placed in-water to stabilize stream banks, thus the area affected by installing permanent and temporary RSP is isolated during installation. Additionally, these features are temporary, typically installed for a period of 1–2 months. Impacts associated with water quality, habitat modifications, and disturbance will be temporary in nature and may result in behavioral changes to eulachon, such as avoidance of the work area.
- **PA-21: Place concrete and concrete slurry seal coat in cofferdams, footing and bridge forms.** This PA is Not Likely to Adversely Affect eulachon when implemented in an isolated work area. PA-28 will be implemented prior to material being placed in-water, thus isolating the area affected by a temporary stream crossing during installation. Disturbance of species affected

by work within an active channel is likely as work occurs in an isolated portion of the active channel. Impacts associated with water quality and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area.

- **PA-22: Remove culverts.** This PA is Not Likely to Adversely Affect eulachon when implemented in an isolated work area. PA-28 will be implemented prior to removal of culverts, thus isolating the area affected by removing culverts during construction. Disturbance to eulachon associated with culvert removal includes avoidance of the work area and stream segments adjacent to the work area. Impacts associated with water quality, habitat modifications, and disturbance, such as avoidance of the work area, will be temporary in nature and may result in behavioral changes for the species. Additionally, removal of barrier culverts will provide fish passage and access to habitat previous inaccessible, a beneficial aspect of this PA. Culverts typically removed as part of this PA are associated with water bodies generally not occupied by eulachon; however, from time to time the PA may be implemented in waters that may be occupied by eulachon.
- **PA-23: Clean, retrofit, or install culverts.** This PA is Not Likely to Adversely Affect green sturgeon when implemented in an isolated work area. PA-28 will be implemented prior to the retrofitting or installation of culverts, thus isolating the area affected by this PA during construction. Disturbance to eulachon associated with cleaning, retrofitting, and installing culverts includes avoidance of the work area and stream segments adjacent to the work area. Impacts associated with water quality, habitat modifications, and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area. Additionally, installation of a culvert that replaces a barrier culvert (removed as part of PA-23) will provide access to previously inaccessible habitat, a beneficial aspect of this PA. Culverts typically removed as part of this PA are associated with water bodies generally not occupied by eulachon; however, from time to time the PA may be implemented in waters that may be occupied by eulachon.
- **PA-24: Install fishways or stream gradient control structures.** This PA is Not Likely to Adversely Affect eulachon when implemented in an isolated work area. PA-28 will be implemented prior to the installation of fishways or stream gradient control structures, thus isolating the area affected by this PA during construction. Disturbance to eulachon associated with installing fishways and gradient control structures includes avoidance of the work area and stream segments adjacent to the work area. Impacts associated with water quality and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area. Installation of fishways and grade control structures will modify habitat conditions for green sturgeon; however, these habitat modifications are intended to be beneficial and provide fish passage where fish passage may not currently exist, or to improve fish passage where partial passage may currently exist. These structures may be installed to retard channel scour or bank erosion, which will also improve fish habitat conditions. However, these habitat modifications will generally occur in waters not occupied by eulachon nevertheless, from time to time the PA may be implemented in waters that may be occupied by eulachon.
- **PA-25: Remove existing bridge structure, including footings, piers, and piles.** This PA is Not Likely to Adversely Affect green sturgeon when implemented in an isolated work area. PA-28 will be implemented prior to removal of any bridge structure, thus the area affected by

removing such structure is isolated during construction. Impacts associated with water quality and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area. Removal of bridge structures will modify habitat conditions for eulachon; however, these habitat modifications are anticipated to be unmeasurable, as removed bridge structures will likely be replaced (PA-26) with a similar size and type of structure. Bridge structures that are removed from below the OHWL and not replaced will have a beneficial impact as the channel dynamics will be natural and unimpeded by an artificial structure.

- **PA-26: Install bridge structures, excluding impact pile driving.** This PA is Not Likely to Adversely Affect eulachon when implemented in an isolated work area. PA-28 will be implemented prior to installation of any bridge structure, thus isolating the area affected by installing such structures during construction. Impacts associated with water quality and disturbance will be temporary in nature and may result in behavioral changes to the species, such as avoidance of the work area. Installation of bridge structures will modify habitat conditions for eulachon; however, these habitat modifications are relatively minor, as the installed structures will be replacing structures removed per PA-25, or replacing culverts removed per PA-22. Installing a bridge structure to replace a culvert will improve habitat conditions for eulachon.
- **PA-27: Blast rock and other substrate.** This PA is Not Likely to Adversely Affect green sturgeon when implemented at a distance at least twice the set-back distances outlined in Chapter 6 (Table 6.2). Blasting at a distance twice the setback distances outlined in Chapter 6 will ensure that adverse impacts associated with compressive shock waves and potential harassment will be avoided.
- **PA-29: Implement BMPs.** This PA is Not Likely to Adversely Affect eulachon when BMPs developed and implemented result in disturbance, such as installation of outlet protection and velocity dissipation devices being installed adjacent to waters occupied by covered species or when a PA requires BMPs associated with material and equipment use over water, which may cause behavioral changes in eulachon.
- **PA-30: Mitigation framework for potential adverse impacts on species listed under CESA.** This PA is Not Likely to Adversely Affect eulachon when implemented in streams during periods when covered species are not present in the stream, but modifies habitat conditions within portions of streams that covered species do occupy during part of the year.

General criteria applicable to a Not Likely to Adversely Affect determination for eulachon are listed below.

- The in-water work associated with the covered activities may increase turbidity to levels that may limit foraging success of eulachon. However, increases in turbidity will be of a short duration, and eulachon that may occur within the defined project action area will be able to avoid areas with increased turbidity. Increases in turbidity are not expected to become elevated to a point that may harm or injure a fish.
- None of these activities require fish exclusion or handling.
- None of these activities will produce elevated underwater noise levels that could result in injury.

- The SSPs/PAs do not result in the release of hazardous materials.
- Disturbance to prey base from these activities is expected to be temporary and at such a small scale as to be insignificant and discountable.

Likely to Adversely Affect

The information and analysis presented in this PBA support the finding that under certain circumstances an SSP warrants a determination of **Likely to Adversely Affect** for eulachon. Such a determination may be appropriate under the following circumstances.

Eulachon are documented as occurring in surface waters that may be affected during determination of **Likely to Adversely Affect** is warranted for the activities indicated below based on the following rationale.

- **PA-27: Blast rock and other substrate.** The blasting of rock and other substrate (PA-27) can cause increases in noise and pressure waves that can adversely affect fish. A rapid decrease in ambient hydrostatic pressure in the range of 100 kPa resulting from the detonation of an explosive charge may have an adverse affect on eulachon similar to the effect on covered salmon and steelhead. The adherence to the setback distances outlined in Table 6.2 in Chapter 6 will avoid potential injury or mortality associated with PA-27, however potential adverse impacts (harassment) may still result from blasting activities that adhere to these setback guidelines.
- **PA-28: Capture, handle, exclude, salvage, and relocate listed species.** The exclusion, capture, handling, and release of eulachon from a stream in order to isolate an in-water work area to complete an SSP will put the fish as risk of physical bodily injury as well as increased stress associated with handling the fish. PA-28 may be required to complete eight SSPs covered under this PBA, however PA-28 will not be required each time one of these SSPs is implemented. However, when PA-28 is implemented it will likely have an adverse affect on eulachon.

Critical Habitat

- Critical habitat for eulachon has not been proposed.

7.2.5 Marine Turtles

Leatherback, olive ridley, loggerhead, and green turtles are under the jurisdiction of the NMFS and these species may occur off the coast of California in marine waters adjacent to Caltrans Districts 1 and 4. Marine turtles are occasionally found in the nearshore marine environment in the coverage area, although they are mainly pelagic in this region.

Leatherback Turtle

The information and analysis presented in this PBA support the finding that the project warrants a determination of **No Effect** for leatherback turtle. This determination is warranted based on the following rationale:

- Leatherback turtle is highly unlikely to occur within the defined project action area for the covered activities.

- The covered activities will occur in coastal areas of northern California, but are not anticipated to affect nearshore or marine habitats where leatherback sea turtles may occur.

Critical habitat for leatherback turtles was designated in 44 FR 17710; March 23, 1979. Critical habitat for the leatherback turtle is not found in the coverage area.

Olive Ridley Turtle

The information and analysis presented in this PBA support the finding that the project warrants a determination of **No Effect** for olive ridley turtle. This determination is warranted based on the following rationale:

- Olive ridley turtle is highly unlikely to occur within the defined project action area for the covered activities.
- The covered activities will occur in coastal areas of northern California, but are not anticipated to affect nearshore or marine habitats where olive ridley turtles may occur.

Critical habitat has not been designated for olive ridley turtles at this time.

Loggerhead Turtle

The information and analysis presented in this PBA support the finding that the project warrants a determination of **No Effect** for loggerhead turtle. This determination is warranted based on the following rationale:

- The loggerhead sea turtle is highly unlikely to occur within the defined project action area for the covered activities.
- The covered activities will occur in coastal areas of northern California, but are not anticipated to affect nearshore or marine habitats where loggerhead sea turtles may occur.

Critical habitat has not been designated for loggerhead turtles at this time.

Green Turtle

The information and analysis presented in this PBA support the finding that the project warrants a determination of **No Effect** for green turtle. This determination is warranted based on the following rationale:

- Green sea turtle is highly unlikely to occur within the defined project action area for the covered activities.
- The covered activities will occur in coastal areas of northern California, but are not anticipated to affect nearshore or marine habitats where green sea turtles may occur.

Critical habitat for green turtles was designated in 63 FR 46693; September 2, 1998. Critical habitat for green turtles is not located in the coverage area.

7.2.6 Marine Mammals

Steller sea lion and blue, humpback, fin, sei, and sperm whales are NMFS-listed marine mammal species found in Caltrans Districts 1 and 4. Conditions for NE, NLTAA, and LTAA determinations for these species depend on the presence of these species; proximity of project activity to marine waters; species use of the water body (haulouts, foraging, or migration); level of disturbance; ability to contain activity within previously developed areas; and use of appropriate CMs.

Steller Sea Lion

The information and analysis presented in this PBA was the basis of the finding that the project warrants a determination of **No Effect** for Steller sea lion. This determination is warranted based on the following rationale:

- Steller sea lions do occur in the marine waters adjacent to Districts 1 and 4, however they typically occur off-shore.
- The covered activities do not include work in marine waters.
- Of the factors affecting Steller sea lion (i.e., predation, harvest or other direct mortality by humans, entanglement in marine debris, disease and parasitism, toxic substances, reduced prey biomass and quality, disturbance and global climate change) only one of these may occur as a result of performance of the covered activities; reduced prey biomass. The covered activities will impact Pacific salmon, a prey resource of Steller sea lions, but the impact to Pacific salmon is not anticipated to have a measurable impact on Steller sea lions when accounting for all the potential factors affecting Steller sea lions.

The information and analysis presented in this PBA was the basis of the finding that the project warrants a determination of **Not Likely to Adversely** A**ffect** designated critical habitat for the Steller's sea lion. This determination is warranted based on the following rationale:

- Steller's sea lion designated critical habitat does occur in the marine waters adjacent to Districts 1 and 4, within 3,000 feet of Caltrans managed roadways (Sugarloaf Isl./Cape Mendocino and Ano Nuevo Isl.).
- The covered activities do not include work in marine waters.
- No direct modification of Steller sea lion designated critical habitat will occur as a result of the covered activities, however an SSP may be implemented within designated critical habitat during the life of the PBA.

Blue Whale

The information and analysis presented in this PBA support the finding that the project warrants a determination of **No Effect** for blue whale. This determination is warranted based on the following rationale:

- Blue whale is highly unlikely to occur within the defined project action area for the covered activities.

- The covered activities will occur adjacent to coastal marine waters of northern California and noise generated by the covered activities is unlikely to reach waters where blue whales may occur.
- Blue whales typically occur one hundred or more miles off the coast of California, so the likelihood that the covered activities will affect blue whales is extremely improbable.

Critical habitat has not been designated for blue whales at this time.

Humpback Whale

The information and analysis presented in this PBA support the finding that the project warrants a determination of **No Effect** for the humpback whale. This determination is warranted based on the following rationale:

- Humpback whales are documented as occurring in the marine waters south of the coverage area and are not known to occur at any regular frequency.
- The covered activities will not require work in marine waters potentially occupied by humpback whales.
- Covered activities are not anticipated to impact prey resources of humpback whales.

Critical habitat has not been designated for humpback whales at this time.

Fin Whale

The information and analysis presented in this PBA support the finding that the project warrants a determination of **No Effect** for fin whale. This determination is warranted based on the following rationale:

- Tin whale is highly unlikely to occur within the defined project action area for the covered activities.
- The covered activities will occur adjacent to marine waters and noise and other potential impacts on fin whales are not likely to reach waters where fin whales may occur.
- Fin whales typically occur one hundred or more miles off the coast of California, so the likelihood that the covered activities will affect fin whales is extremely improbable.

Critical habitat has not been designated for fin whales at this time.

Sei Whale

The information and analysis presented in this PBA support the finding that the project warrants a determination of **No Effect** for sei whale. This determination is warranted based on the following rationale:

- Sei whale is highly unlikely to occur within the defined project action area for the covered activities.
- The covered activities will occur adjacent to marine waters and noise and other potential impacts on sei whales are not likely to reach waters where sei whales may occur.

- Sei whales typically occur one hundred or more miles off the coast of California, so the likelihood that the covered activities will affect fin whales is extremely improbable.

Critical habitat has not been designated for sei whales at this time.

Sperm Whale

The information and analysis presented in this PBA support the finding that the project warrants a determination of **No Effect** for sperm whale. This determination is warranted based on the following rationale:

- Sperm whale is highly unlikely to occur within the defined project action area for the covered activities.
- The covered activities will occur adjacent to marine waters and noise and other potential impacts on sperm whales are not likely to reach waters where sperm whales may occur.
- Sperm whales typically occur one hundred or more miles off the coast of California, so the likelihood that the covered activities will affect sperm whales is extremely improbable.

Critical habitat has not been designated for sperm whales at this time.

Chapter 8 Programmatic Authorization

As described in Chapter 2, once an effect determination has been made for an SSP, that SSP can be categorized according to the level of regulatory review necessary for authorization and implementation. SSPs that would result in an NE determination (Category 1; Figure 2-1) will have no impacts on covered species and can implemented without consultation; it is partial goal of this document to articulate those activities that are considered to have no effect for the sake of clarity. SSPs that would result in an NLTAA determination (Category 2) will also be assumed to have only minimal or discountable impacts on covered species following implementation of all appropriate BMPs and ABMPs and can be implemented in accordance with procedural concurrence authorization.

However, annual or semiannual reports summarizing the scope and effects of most of these SSPs will be provided to the responsible agencies for review and for consideration of reclassification of effect determinations. Should an SSP show a likelihood of potential adverse effects on any covered species, it will be reclassified to LTAA (Category 3) and be managed in the future under the stricter implementation, mitigation, and monitoring guidelines for Category 3 SSPs.

SSPs that initially result in LTAA determinations will require submittal and approval of a project long-form or a specific form tailored to a particular project type that provides detailed information on the potential impacts on covered species, the BMPs/ABMPs that will be implemented to avoid or minimize take of any covered species, and the level of take that will occur, if such take has been authorized by the PBO. Category 3 projects that repeatedly and consistently receive full authorization to proceed and are shown to have no adverse effect on covered species when appropriate BMPs and ABMPs are applied, at the discretion of the reviewing agencies, may be reduced to Category 1 or 2 status as appropriate to expedite the review and approval process. The approval process for Category 3 projects is expected to consist of a letter concurring that the SSP is consistent with the PBO and that appropriate BMPs and ABMPs will be employed in order to minimize potential incidental take.

In this chapter, eight Category 1 or Category 2 SSPs that comprise approximately 90% of the routine maintenance activities conducted by Caltrans are described to illustrate their NE or NLTAA status and to seek early programmatic authorization as part of the PBA/PBO review and approval process. The following SSPs with attached conditional criteria are expected to be either NE or NLTAA; these activities will not be reported and will have a lesser level of documentation. However documentation will be included sufficient to support a finding that either the listed species is not present or is not likely to be adversely affected by the SSP. These subcategories of SSPs will be tracked and monitored randomly on a regular basis to ensure that documentation is sufficient, BMPs and ABMPs are employed properly and that there are no adverse effects. The monitoring/audit team will be an interagency team including staff of Caltrans and trustee agencies.

8.1 Removal of Slide and Alluvial Debris and Soil from Roadways, Road Shoulders, and Side Slopes

8.1.1 Conditions

- Debris material confined mostly to highway right-of-way, but may include upland areas with minimal potential for slope failure with erosion control BMPs implemented.
- No covered species known or expected to occur in the SSP action area, with the exception of species that could only be affected by noise generated by the activity and when the activity is not expected to generate noise levels of a level that could cause an adverse affect.
- No substantial vegetation clearing (less than 0.5 acre).
- Debris removed to designated and appropriate repositories.

8.1.2 Best Management Practices

- Stabilization activity entrance/exit (C.12.1, TC-1)
- Tire inspection and sediment removal (C.12.2, TC-2)
- Spill prevention and control (C.13.1, WM-4)
- Solid waste management (C.13.2, WM-5)
- Liquid waste management (C.13.6, WM-10)
- Material delivery and storage (C.14.1, WM-1)
- Material use (C.14.2, WM-2)
- Stockpile management (C.17, WM-3)
- Water conservation practices (C.18, NS-1)
- Sweeping and vacuuming (C.29, SC-7)

8.2 Maintenance, Repair, and Replacement of Asphalt, Concrete, and Other Construction Materials on Roads

8.2.1 Conditions

- Maintenance and repair activities confined to highway right-of-way and disturbed roadway prism where the habitat requirements of potential listed plant species do not include disturbed areas.
- No covered species known or expected to occur in the SSP action area and vicinity, with the exception of species that could be affected by noise generated by the activity and when the activity is not expected to generate noise levels of a level that could cause an adverse affect.
- No substantial vegetation clearing (less than 0.5 acre).

- Debris removed to designated and appropriate repositories.

8.2.2 Best Management Practices

- Tire inspection and sediment removal (C.12.2, TC-2)
- Spill prevention and control (C.13.1, WM-4)
- Solid waste management (C.13.2, WM-5)
- Hazardous waste management (C.13.3, WM-6)
- Liquid waste management (C.13.6, WM-10)
- Concrete waste management (C.13.7, WM-8)
- Paving operation procedures (C.16, NS-3)
- Material delivery and storage (C.14.1, WM-1)
- Material use (C.14.2, WM-2)
- Stockpile management (C.17, WM-3)
- Sweeping and vacuuming (C.29, SC-7)

8.2.3 Additional Best Management Practices

- Install falsework to keep bridge debris and construction, maintenance, and repair materials from falling into streams (ABMP-6-1)

8.3 Installation and Replacement of Signs

8.3.1 Conditions

- Sign installation confined to highway right-of-way.
- No covered species known or expected to occur in the SSP action area, with the exception of species that could only be affected by noise generated by the activity and when the activity is not expected to generate noise levels of a level that could cause an adverse affect.
- No substantial vegetation clearing (less than 0.5 acre).

8.3.2 Best Management Practices

- Spill prevention and control (C.13.1, WM-4)
- Sweeping and vacuuming (C.29, SC-7)

8.4 Installation and Replacement of Guardrails

8.4.1 Conditions

- Guardrail installation or replacement confined to highway right-of-way.

- No covered species known or expected to occur in the SSP action area, with the exception of species that could only be affected by noise generated by the activity and when the activity is not expected to generate noise levels of a level that could cause an adverse affect.
- No substantial vegetation clearing (less than 0.5 acre).

8.4.2 Best Management Practices

- Spill prevention and control (C.13.1, WM-4)
- Hazardous waste management (C.13.3, WM-6)
- Liquid waste management (C.13.6, WM-10)
- Material and equipment use over water (NS-13)
- Material use (C.14.2, WM-2)
- Sweeping and vacuuming (C.29, SC-7)

8.4.3 Additional Best Management Practices

- Install falsework to keep bridge debris and construction, maintenance, and repair materials from falling into streams (ABMP 6.1)

8.5 Drainage Channel and Ditch Cleaning to Maintain Function and Avoid Damage to Adjacent Roads

8.5.1 Conditions

- No substantial riparian vegetation clearing.
- Debris removed to designated and appropriate repositories, except that small amounts (less than 0.5 cubic yards -- can be scattered out of the channel in locations where they will not reenter the stream).

8.5.2 Best Management Practices

- Spill prevention and control (C.13.1, WM-4)
- Solid waste management (C.13.2, WM-5)
- Liquid waste management (C.13.6, WM-10)
- Material use (C.14.2, WM-2)
- Stockpile management (C.17, WM-3)
- Sweeping and vacuuming (C.29, SC-7)

8.5.3 Additional Best Management Practices

- Environmentally sensitive areas will be fenced to prevent encroachment of personnel or equipment into wetlands, riparian areas, stream channels and banks, and other sensitive habitats (ABMP-10.4)

8.6 Sediment and Debris Cleaning from Culverts and Bridge Abutments and Supports to Minimize Erosion and Damage to Roads, Culverts, and Bridges and to Maintain Streamflow Conditions

8.6.1 Conditions

- Work only when work area is dry or has impounded water not containing covered species or when covered species are not present and work is done using a clean water bypass to avoid introduction of suspended sediment into downstream habitat.
- No substantial riparian vegetation clearing.
- Debris removed to designated and appropriate repositories.

8.6.2 Best Management Practices

- Solid waste management (C.13.2, WM-5)
- Material and equipment use over water (NS-13)
- Material use (C.14.2, WM-2)

8.6.3 Additional Best Management Practices

- Environmentally sensitive areas will be fenced or otherwise marked to prevent encroachment of personnel or equipment into wetlands, riparian areas, stream channels and banks, and other sensitive habitats (ABMP-10.4)
- Work only in dry streambeds or within cofferdams (ABMP-14.1)
- Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, conduct all in-water activities outside the spawning and incubation season for listed fish species or to periods identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions (ABMP-14.7)
- Preserve stream width, depth, velocity, and slope that provide upstream and downstream passage of adult and juvenile fish according to NMFS and DFG guidelines and criteria or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions (ABMP-15)

8.7 Rehabilitate Culverts to Maintain Function

8.7.1 Conditions

- Work only when work area is dry or has impounded water not containing covered species or when covered species are not present and work is done using a clean water bypass to avoid introduction of suspended sediment into downstream habitat.
- No substantial riparian vegetation clearing.
- Debris removed to designated and appropriate repositories.

8.7.2 Best Management Practices

- Solid waste management (C.13.2, WM-5)
- Structure demolition and removal over or adjacent to waters (NS-15)
- Concrete waste management (C.13.7, WM-8)
- Material and equipment use over water (NS-13)
- Material use (C.14.2, WM-2)

8.7.3 Additional Best Management Practices

- Environmentally sensitive areas will be fenced or otherwise marked to prevent encroachment of personnel or equipment into wetlands, riparian areas, stream channels and banks, and other sensitive habitats (ABMP-10.4)
- Work only when work area is dry or has impounded water not containing covered species or when covered species are not present and work is done using a clean water bypass to avoid introduction of suspended sediment into downstream habitat (ABMP-14.1).
- Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, conduct all in-water activities outside the spawning and incubation season for listed fish species or to periods identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions (ABMP-14.7)
- Preserve stream width, depth, velocity, and slope that provide upstream and downstream passage of adult and juvenile fish according to NMFS and DFG guidelines and criteria or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions (ABMP-15)

8.8 Replace Culverts to Maintain Culvert Function and, Where Practicable, Improve Flow Conditions to Support Fish Passage and Sediment Transport

8.8.1 Conditions

- Work only when work area is dry or has impounded water not containing covered species or when covered species are not present and work is done using a clean water bypass to avoid introduction of suspended sediment into downstream habitat.
- No riparian vegetation clearing**.**
- Debris removed to designated and appropriate repositories.

8.8.2 Best Management Practices

- Solid waste management (C.13.2, WM-5)
- Structure demolition and removal over or adjacent to waters (NS-15)
- Concrete waste management (C.13.7, WM-8)
- Material and equipment use over water (NS-13)

- Material use (C.14.2, WM-2)

8.8.3 Additional Best Management Practices

- Environmentally sensitive areas will be fenced or otherwise marked to prevent encroachment of personnel or equipment into wetlands, riparian areas, stream channels and banks, and other sensitive habitats (ABMP-10.4)
- Work only when work area is dry or has impounded water not containing covered species or when covered species are not present and work is done using a clean water bypass to avoid introduction of suspended sediment into downstream habitat (ABMP-14.1).
- Work only in dry streambeds or within cofferdams (ABMP-14.1)
- Except for streams identified by NMFS, USFWS, and DFG as not supporting spawning habitat, do not conduct in-water activities unless conducted pursuant to requirements identified in cooperation with NMFS, USFWS, and DFG to accommodate site-specific conditions (ABMP-4.7)
- Preserve stream width, depth, velocity, and slope that provide upstream and downstream passage of adult and juvenile fish according to NMFS and DFG guidelines and criteria or as developed in cooperation with NMFS and DFG to accommodate site-specific conditions (ABMP-15)

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Appendix A Federally Listed Species Descriptions

Appendix A Federally Listed Species Descriptions

A.1 Fish

For each species, several different evolutionarily significant units (ESUs) and distinct population segments (DPSs) are listed as threatened or endangered. The status, habitat requirements and life histories for each species are given first, followed by a detailed description of the critical habitat designation for each ESU/DPS, when the critical habitat is relatively distinct to that ESU/DPS.

Designated critical habitat for several ESUs/DPSs was withdrawn in 2002 following legal action and then redesignated in 2005. For those ESUs/DPSs for which critical habitat was redesignated in 2005, a discussion of that critical habitat is provided in Section B.1.5.

A.1.1 Chinook Salmon (*Oncorhynchus tshawytscha*)

Status

The following Chinook salmon runs have been listed as threatened or endangered in the coverage area (70 FR 37160):

- California Coastal Chinook salmon: listed as threatened on June 28, 2005.
- Sacramento River Winter-Run Chinook salmon: listed as endangered on June 28, 2005.
- Central Valley Spring-Run Chinook: listed as threatened on June 28, 2005.

Threats to these Chinook salmon ESUs include watershed development, forest practices, urbanization, agricultural land use, mining, hydropower development, and water manipulation and withdrawal. Overfishing, artificial propagation, and the introduction of nonnative species have also affected Chinook salmon. These activities have resulted in increased sedimentation, altered flow regimes and channel morphology, decreased water quality and quantity, loss of riparian habitat, loss of large woody debris, loss of large woody debris recruitment, elevated water temperatures, decreased gravel recruitment, reduced pools and spawning and rearing areas, rerouted stream channels, degraded streambanks, and loss of estuarine rearing areas (Bishop and Morgan 1996, Myers et al. 1998). These changes have affected the spawning and rearing environment of Chinook salmon. Harvest, hatchery practices, and the introduction of nonnative species have also affected the expression of the varied life history strategies of Chinook salmon in these ESUs.

Within these ESUs are some hatchery stocks considered essential to the recovery of the species (70 FR 37177). A total of 10 hatchery stocks are included in the ESUs that occur in the coverage area, as identified below:

- California Coastal Chinook salmon: seven hatchery stocks (the Humboldt Fish Action Council [Freshwater Creek], Yager Creek, Redwood Creek, Hollow Tree, Van Arsdale Fish

Station, Mattole Salmon Group, and Mad River Hatchery fall-run Chinook hatchery programs)

- Sacramento River Winter-Run Chinook salmon: two hatchery stocks (winter-run Chinook from the Livingston Stone National Fish Hatchery, and winter-run Chinook in a captive broodstock program maintained at Livingston Stone National Fish Hatchery and the University of California Bodega Marine Laboratory)
- Central Valley Spring-Run Chinook salmon: one hatchery stock (Feather River Hatchery spring-run Chinook program)

Habitat Requirements

The generalized life history of Pacific salmon involves incubation, hatching and emergence in freshwater, migration to the ocean, and subsequent initiation of maturation and return to freshwater for completion of maturation and spawning (Myers et al. 1998). Chinook salmon exhibit two generalized freshwater life history types, stream-type and ocean-type (Gilbert 1912). There is further life history variation within each type, which allows full utilization of freshwater, estuarine, and ocean environments (Spence et al. 1996).

In order to complete these life history strategies successfully, Chinook salmon need access to freshwater, estuarine, coastal, and open ocean environments. In these environments they require adequate water quantity, quality, temperature, and velocity; substrate, cover and shelter; food resources; riparian vegetation; space; and safe passage conditions. The range of ocean residence for Chinook salmon is from 1 to 6 years. A small proportion of yearling males, called jacks, mature in freshwater or return after 2 to 3 months in saltwater (Myers et al. 1998, Spence et al. 1996). In general, Chinook salmon spawn in small to medium-sized rivers; however, they may also spawn in larger river systems (Spence et al. 1996).

Ocean-type Chinook salmon migrate to sea normally within a few months after emergence. They reside in estuaries for longer periods as fry and fingerlings than do stream-type Chinook salmon (Reimers 1973, Kjelson et al. 1982, Healey 1991). Juvenile Chinook salmon utilize estuaries for rearing, physiological transition and refugia, and are the most estuarine-dependent anadromous salmonids in the Pacific Northwest (Aitkin 1998). Ocean-type Chinook salmon spend most of their ocean life in coastal waters, and return to their natal river during the spring, summer, fall, late fall and winter (National Marine Fisheries Service 1998). Ocean-type Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to spawning areas on the mainstem or lower tributaries of rivers, and spawn within a few days or weeks of freshwater entry (Healey 1991).

For ocean-type Chinook salmon, estuarine rearing environments may be more important than the freshwater environment, as these salmon can rear between 3 to 6 months in freshwater and estuarine environments (Healey 1991, Meehan and Bjornn 1991). For ocean-type Chinook salmon, estuarine environments provide staging, physiological transition, refugia from high water flows and predation; and neustonic, pelagic and benthic prey food bases. As the Chinook salmon grow, their position and food base in estuaries changes. Larger fish move to deeper and more saline water (Healey 1982, Macdonald et al. 1987, cited in Aitkin 1998) and their prey base changes to include decapod larvae, larval and juvenile fish, drift insects, and euphausiids

(Simenstad et al. 1982). Both of these benthic prey bases are dependent on detritus (Sibert et al. 1977, Sibert 1979 in Aitkin 1998). Juvenile salmonids tend to congregate in areas where estuary morphology favors detritus retention, such as weed beds, braided or meandering channels, and salt marshes (Healey 1982). Estuaries with a variety of water salinity gradients, microhabitats created by large wood, boulders, channel morphology and vegetation provide cover from predation, a good prey base and low water velocity refugia at low tide (Aitkin 1998).

Stream-type Chinook salmon, characteristic of spring fish (Spence et al. 1996), reside as fry or parr in freshwater for a year or more before migrating to sea. They perform extensive offshore oceanic migrations and return to their natal river during the spring and early summer, several months prior to spawning (Healey 1991). Stream-type Chinook salmon tend to enter freshwater as immature or “bright” fish, migrate far upriver, and use upper watersheds for spawning in late summer and early autumn (Myers et al. 1998). Stream-type juvenile Chinook salmon exhibit downstream dispersal and use a variety of freshwater environments during their 1 to 2 years of freshwater rearing before migration to the ocean (Meehan and Bjornn 1991). Stream-type juvenile Chinook salmon fry in streams feed on drift insects (Rutter 1904 in Allen and Hassler 1986) but zooplankton are more heavily preyed on in main river systems and estuaries (Allen and Hassler 1986). As Chinook salmon grow, they move from shallow littoral habitats into deeper river channels and their prey base changes from shallow epibenthic prey to larger pelagic species (Allen and Hassler 1986). Cool, clean water, complex habitat diversity that provides pools, riffles, off-channel habitat, and undercut banks, large woody debris or boulder structures that provide cover and shelter from predation and storm events are important habitat elements. Riparian vegetation provides the following to Chinook salmon rearing: shade for temperature regulation, vegetation inputs for food resources, streambank stabilization from roots, and large woody debris recruitment. Stream-type life history strategies may be adapted to watersheds or parts of watersheds that are more productive and less susceptible to dramatic changes in water flow, as the long rearing period requires more stable less degraded habitats (Miller and Brannon 1982, Healey 1991).

Critical Habitat for Sacramento River Winter-Run ESU

On June 16, 1993, critical habitat for the Sacramento River winter-run Chinook salmon ESU was designated to include the Sacramento River from Keswick Dam (River Mile [RM] 302) to Chipps Island (RM 0) at the western margin of the Sacramento-San Joaquin Delta; all waters from Chipps Island west to Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and Carquinez Strait; all waters of San Pablo Bay westward of the Carquinez Bridge; and all waters of the San Francisco Bay (north of the San Francisco/Oakland Bay Bridge) from San Pablo Bay to the Golden Gate Bridge (58 FR 33212). Within the Sacramento River, critical habitat includes the river water, river bottom (including those areas and associated gravel used by winter-run Chinook salmon as spawning substrate), and the adjacent riparian zone. It also includes Kimball Island, Winter Island, and Browns Island, and estuarine areas westward of Chipps Island. Critical habitat is not designated in any estuarine sloughs within San Francisco or San Pablo Bay or any open ocean habitat used by this ESU.

Critical Habitat for Other Chinook Salmon ESUs

Designated critical habitat for the following ESUs is discussed in Section B.1.5.

- California Coastal Chinook salmon
- Central Valley Spring-Run Chinook salmon

A.1.2 Coho Salmon (*Oncorhynchus kisutch*)

Status

The following coho salmon runs have been listed as threatened or endangered within the coverage area (70 FR 37160):

- Central California Coast Coho salmon: listed as endangered on June 28, 2005.
- Southern Oregon/Northern California Coasts Coho salmon: listed as threatened on June 28, 2005.

Threats to coho salmon populations include hydropower development, water withdrawal and diversions, water storage, harvest, predation, inadequate regulatory mechanisms (National Marine Fisheries Service 1991), forestry and associated road building (Dlugokenski et al. 1981, Blum 1988), agriculture, mining, and urbanization. These activities have degraded, simplified, and fragmented habitat (60 FR 38011).

Within these ESUs are some hatchery stocks considered essential to the recovery of the species (70 FR 37177). A total of seven hatchery stocks are included in the ESUs that occur in the coverage area, as identified below:

- Central California Coast Coho salmon: four hatchery stocks (the Don Clausen Fish Hatchery Captive Broodstock Program, Scott Creek/King Fisher Flats Conservation Program, Scott Creek Captive Broodstock Program, and the Noyo River Fish Station egg-take Program coho salmon hatchery programs)
- Southern Oregon/Northern California Coasts Coho: three hatchery stocks (the Cole Rivers Hatchery (Oregon Department of Fish and Wildlife (ODFW) stock #52), Trinity River Hatchery, and Iron Gate Hatchery coho salmon hatchery programs)

Habitat Requirements

In contrast to the life history patterns of other anadromous salmonids, coho salmon exhibit a relatively simple, 3-year life cycle. Coho salmon are anadromous, meaning they migrate from the ocean to spawn in fresh water. Adults at sea typically begin their freshwater spawning migration in the late summer and fall, spawn by mid-winter, and then die. Run and spawn timing of adult coho salmon varies. Coho salmon freshwater habitat includes small, relatively low-gradient tributary streams used for spawning and juvenile rearing, and lakes used for rearing. Coho salmon excavate redds (gravel nests excavated by spawning females) in pea- to orange-sized spawning gravel. Depending on temperature, eggs incubate in redds for 1.5 to 4 months before hatching as alevins (a larval life stage dependent on food stored in a yolk sac). Following yolk sac absorption, alevins emerge from the gravel as young juveniles or fry and begin actively feeding. Juveniles rear in fresh water for up to 15 months, overwintering primarily in off-channel

alcoves and beaver ponds, where available. Juveniles prefer complex instream structure (primarily large and small woody debris) and shaded streams with tree-lined banks for rearing. After rearing in freshwater, young coho migrate to the ocean as smolts in the spring. Coho salmon typically spend two growing seasons in the ocean before returning to their natal stream to spawn as 3-year-olds. Some precocious males, called jacks, return to spawn after only 6 months at sea (60 FR 38011, Oregon Department of Fish and Wildlife 2008).

Critical Habitat for Central California Coast ESU

On May 5, 1999, critical habitat for the Central California Coast coho salmon ESU was designated to include all river reaches accessible to listed coho salmon (including estuarine areas and tributaries) from Punta Gorda in northern California to the San Lorenzo River in central California (inclusive), including Arroyo Corte Madera Del Presidio and Corte Madera Creek, tributaries to San Francisco Bay (64 FR 24049). Critical habitat includes all waterways, substrates, and adjacent riparian zones below longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years) and excludes tribal lands.

Critical Habitat for Southern Oregon/Northern California Coasts ESU

On May 5, 1999, critical habitat for the Southern Oregon/Northern California Coasts coho salmon ESU was designated to include all river reaches accessible to listed coho salmon (including estuarine areas and tributaries) between the Elk River at Cape Blanco, Oregon, and the Mattole River at Punta Gorda in northern California (64 FR 24049). Critical habitat includes all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years) and excludes tribal lands.

A.1.3 Steelhead (*Oncorhynchus mykiss*)

Status

The following steelhead DPSs have been listed as threatened (71 FR 834):

- Northern California: listed as threatened on January 5, 2006
- Central California Coast: listed as threatened on January 5, 2006
- California Central Valley: listed as threatened on January 5, 2006

Threats to steelhead include grazing, water diversions, hydroelectric development, forestry, and associated road building (Yee and Roelofs 1980, Platts 1981, Chamberlin 1982). These activities contribute to habitat degradation (Busby et al. 1996), failure of natural stocks to replace themselves, genetic homogenization due to hatchery supplementation, and high harvest rates on steelhead smolts in rainbow trout fisheries.

Within these ESUs are some hatchery stocks considered essential to the recovery of the species (70 FR 37177). A total of six hatchery stocks are included in the ESUs that occur in the coverage area, as identified below:

- Northern California Steelhead: two hatchery stocks (the Yager Creek Hatchery and the North Fork Gualala River Hatchery [Gualala River Steelhead Project] steelhead hatchery programs)

- Central California Coast Steelhead: two hatchery stocks (the Don Clausen Fish Hatchery and the Kingfisher Flat Hatchery/Scott Creek [Monterey Bay Salmon and Trout Project] steelhead hatchery programs)
- California Central Valley Steelhead: two hatchery stocks (the Coleman National Fish Hatchery, and Feather River Hatchery steelhead hatchery programs)

Habitat Requirements

Steelhead exhibit a great diversity of life history patterns, and are phylogenetically and ecologically complex. Steelhead exhibit varying degrees of anadromy, differences in reproductive biology, and plasticity of life history between generations (Busby et al. 1996). Different life history forms include anadromous and nonanadromous, winter or summer steelhead, inland or coastal groupings, and half-pounder strategies. Steelhead and cutthroat trout can spawn more than once (iteroparity), whereas all other species of *Oncorhynchus* spawn once and then die (semelparity). North of Oregon, repeat spawning is relatively uncommon and more than two spawning migrations is rare. In Oregon and California, the frequency of two spawning migrations is higher, but more than two spawning migrations is still unusual. Iteroparity occurs predominantly in females (Busby et al. 1996). Anadromous forms can spend up to 7 years in freshwater and 3 years in the ocean prior to their first spawning (Busby et al. 1996).

In North America, steelhead are split into two phylogenetic groups, inland and coastal (Busby et al. 1996). Both groups occur in Washington, Oregon, and British Columbia (Busby et al. 1996), and are separated in the Columbia and Fraser systems in the vicinity of the crest of the Cascade Mountains (Reisenbichler et al. 1992). Only coastal steelhead occur in the coverage area.

In typical coastal populations of northern California, Oregon and Washington, total age at maturity is typically 4 years: 2 years in freshwater and 2 years in the ocean (Busby et al. 1996). Steelhead from central and southern California tend to spend less time in the ocean and are usually 3 years old at spawning: 2 years in freshwater and 1 year in the ocean. Steelhead with different run timing (summer or winter) in the same geographic area may be more genetically similar to each other than to fish from another area with similar run timing (Busby et al. 1996).

Steelhead have two basic reproductive ecotypes, based on the state of their sexual maturity at river entry and the durations of the spawning migration (Burgner et al. 1992). These reproductive ecotypes are stream maturing or summer steelhead, or ocean maturing or winter steelhead (Busby et al. 1996). Summer steelhead enter fresh water from May to October in a sexually immature state, migrate upstream during the spring and summer, and hold in areas of protected cover such as deep pools, undercut banks, overhanging vegetation, large woody debris, or boulder structures until they become sexually mature. These summer steelhead do not spawn until the following spring (Pauley et al. 1986), so they hold over the fall and winter in freshwater.

Winter steelhead enter their home stream in various stages of sexual maturation from November to April, and spawn within a few months of entering the river between late March and early May (Pauley et al. 1986). Winter steelhead are the more widespread of the two reproductive types.

Some basins have both summer and winter steelhead present. Where both occur, they are often separated by seasonal hydrologic barriers, such as waterfalls (Busby et al. 1996). It appears

summer steelhead occur where habitat is not fully used by winter steelhead, and summer steelhead spawn further upstream than winter steelhead (Withler 1966, Roelofs 1983, Behnke 1992).

Steelhead also exhibit a half-pounder life history strategy. Half-pounders are immature steelhead that return to freshwater after only 2 to 4 months in the ocean (Busby et al. 1996). These steelhead overwinter in freshwater and outmigrate again the following spring. This is often termed a false spawning migration, as few half-pounders are sexually mature. Occurrence of half-pounder steelhead has been reported only in the Rogue, Klamath, Mad, and Eel Rivers of southern Oregon and northern California (Barnhart 1986).

Nonanadromous forms of steelhead have been called rainbow or redband trout. Nonanadromous and anadromous forms co-occur more frequently in inland populations than in coastal populations (Busby et al. 1996). In coastal populations where they co-occur, the forms are usually separated by a migration barrier, either natural or human-made (Busby et al. 1996).

Where the two forms co-occur, offspring of resident fish may migrate to sea, and offspring of anadromous steelhead may remain in streams as resident fish (Burgner et al. 1992, Shapolov and Taft 1954). Mullan et al. (1992) found evidence in the Methow River, Washington that, due to very cold stream temperatures, juvenile steelhead had difficulty attaining size for smoltification. They concluded that most of the juvenile fish that do not emigrate downstream early in life do not grow enough due to the cold temperatures and are hence restricted to a resident life history, regardless of anadromous or nonanadromous parents.

After hatching and emergence, steelhead move to deeper parts of the stream, establish territories, and change their prey from microscopic aquatic organisms to larger organisms such as isopods, amphipods and aquatic and terrestrial insects, primarily associated with the stream bottom (Wydoski and Whitney 1979). During rearing, streamside vegetation and submerged cover (logs, rocks, and aquatic vegetation) are important. Cover provides food, temperature stability, and protection from predators. Densities of juvenile steelhead are highest in areas containing instream cover (Narver 1976, Reiser and Bjornn 1979, Johnson 1985). Juvenile steelhead remain in freshwater for 1 to 4 years before smoltification. In areas where anadromous and nonanadromous forms co-occur in sympatry, habitat partitioning occurs (Allee 1981). Smoltification may be initiated by environmental factors such as photoperiod, water temperature and water chemistry (Folmar and Dickhoff 1980, Wedemeyer et al. 1980).

Steelhead remain in the ocean for 2 to 3 years, occasionally for 4 years (Shapolov and Taft 1954). Distribution in the ocean is hard to track because schools are not formed, and steelhead do not use areas where commercial harvest of other Pacific salmon stocks occur (Pauley et al. 1986). Distribution at sea appears to be influenced by surface water temperature and conforms closely to the 5°C isotherm in the north and the 15°C isotherm in the south (Sutherland 1973).

Critical Habitat

Designated critical habitat for the following DPSs is described in Section B.1.5:

- Northern California steelhead
- Central California Coast steelhead
- California Central Valley steelhead

A.1.4 Green Sturgeon (*Acipenser medirostris*)

Status

After the completion of a 2002 status review, NMFS determined that the green sturgeon is composed of two distinct population segments (DPSs) that qualify as species under the Endangered Species Act (ESA), but that neither warranted listing as threatened or endangered (68 FR 4433). The "not warranted" determination was challenged on April 7, 2003. NMFS produced an updated status review on February 22, 2005, and reaffirmed that the northern green sturgeon DPS only warranted listing on the Species of Concern List. However, NMFS proposed that the southern DPS be listed as threatened under the ESA. NMFS published a final rule on April 7, 2006 listing the southern DPS as threatened (71 FR 17757).

Habitat Requirements

The green sturgeon is the most widely distributed member of the sturgeon family, and has been recorded in at least six countries: the United States, Canada, Mexico, Russia, Japan, and Korea (Moyle et al. 1992, Deng et al. 2002). Despite its wide geographic distribution in the northern Pacific, the green sturgeon is considered a rare or vulnerable species in the United States and Canada. The only known spawning populations of the southern DPS are in the Klamath, Rogue, and Sacramento rivers (Brown 2006).

Little is known about green sturgeon life history. Newly hatched free embryos are poor swimmers (Kynard et al. 2005). The juveniles migrate out to sea after one to three years in freshwater (Nakamoto et al. 1995). Juveniles feed on benthic invertebrates and exhibit nocturnal behavior during freshwater rearing and outmigration (Cech et al. 2000, Moyle 2001, Kynard et al. 2005). It is not known how long juvenile green sturgeon remain in coastal estuaries.

During the late summer and early fall, subadult and nonspawning adult green sturgeon concentrate in Pacific coastal estuaries north of San Francisco Bay (Emmett et al. 1991), although the reason for this behavior remains unknown. Adult green sturgeon appear to be the most common sturgeon species in Willapa Bay, Washington, while green sturgeon have been observed congregated in the estuary and mainstem of the Columbia River up to Bonneville Dam (Emmett et al. 1991). However, no spawning is known to occur in this system, and the population of origin for these fish is unknown (Rien et al. 2000). Fish tagged in San Pablo Bay, California, have been recovered in the Columbia River estuary, Grays Harbor, and Willapa Bay, Washington (Miller 1972, Israel et al. 2004), which supports the theory of a migratory connection between northern and southern green sturgeon aggregations.

Adult green sturgeon prey on benthic invertebrates, including shrimp, mollusks, amphipods, and occasionally small fish (Moyle et al. 1992).

Adults are believed to spawn every 3 to 5 years and to reside in marine water between spawning runs (Adams et al. 2002), which occur during the summer. Estimated ages of reproductive female green sturgeon from the Klamath River ranged from 25 to 32, while those of the male green sturgeon used in the same artificial spawning ranged from 18 to 30 (Van Eenennaam et al. 2001). Sturgeon are known to have strong homing capabilities and spawning site fidelity (Bemis and Kynard 1997). Green sturgeon spawn in deep pools or "holes" in large, turbulent, freshwater river mainstems (Moyle et al., 1992). Specific spawning habitat preferences are unclear, and can range from clean sand to bedrock substrates, with large cobble substrates apparently favored (Moyle et al., 1995). It is also likely that cold, clean water is important for proper embryonic development.

A principal factor in the decline of the southern DPS of green sturgeon is the reduction of the spawning area to a limited section of the Sacramento River. This limited spawning area increases the risk of extirpation due to catastrophic events. Insufficient freshwater flow rates in spawning areas, contaminants (e.g., pesticides), bycatch of green sturgeon in fisheries, potential poaching (e.g., for caviar), entrainment by water projects, influence of exotic species, small population size, impassable barriers, and elevated water temperatures likely pose a threat to this species (National Marine Fisheries Service 2007b).

Critical Habitat

On September 8, 2008, the NMFS proposed critical habitat in Washington, Oregon, and California for green sturgeon of the southern DPS (73 FR 52084). As proposed, critical habitat is identified in marine, estuarine, and riverine areas.

Critical habitat is broken down to the primary constituent elements (PCEs). The PCEs are comprised of the principal biological or physical constituent elements within the specific areas considered for designation that are essential to conservation of the species, including but not limited to spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, geological formation, vegetation type, tide, and specific soil types (73 FR 52088).

The PCEs essential for the conservation of green sturgeon in freshwater riverine systems, estuarine areas, and marine areas include the following (note: not all PCEs are essential within each environment).

- **Food resources.** Abundant prey items for larval, juvenile, subabult, and adult life stages. Prey resources in riverine systems are not well documented, but it is assumed that green sturgeon feed primarily on fly larvae. Sub-adult and adult green sturgeon in freshwater rivers most likely feed on benthic prey species similar to those fed on in bays and estuaries, including shrimp, clams, and benthic fishes. In bays and estuaries, these items are also important to juvenile green sturgeon.
- **Water flow.** Riverine systems must include stable and sufficient water flow rates in spawning and rearing reaches to maintain water temperatures within the optimal range of egg, larval, and juvenile survival and development. Sufficient flow is needed to flush silt and debris from cobble, gravel, and other substrate surfaces to prevent sedimentation as well as to reduce the incidence of fungal infestation of eggs. Successful migration of adult green sturgeon to and from spawning grounds and successful spawning are dependent upon

sufficient water flow. Sufficient water flow into bays and estuaries is necessary to allow adults to successfully orient to the incoming flow and migrate upstream to spawning grounds. Sufficient flows are needed to attract adult green sturgeon to the Sacramento River to initiate the upstream spawning migration.

- **Water quality.** Good water quality, including temperature, salinity, oxygen content, and other chemical characteristics, is necessary for normal behavior, growth, and viability of all life stages. This PCE is important in riverine, estuarine, and marine areas.
- **Migratory corridor.** This is an important PCE that includes the safe and timely passage within and between freshwater, estuarine, and marine areas. Safe and timely passage is defined to mean that human-induced impediments, either physical, chemical, or biological, do not alter the migratory behavior of the fish such that its survival or the overall viability of the species is compromised (e.g., an impediment that compromises the ability of fish to reach their spawning habitat in time to encounter con-specifics and reproduce).
- **Water depth.** In freshwater systems, deep (>5m) holding pools for both upstream and downstream holding for adult and sub-adult fish, with high associated turbulence and upwelling are critical for green sturgeon spawning and holding. In estuarine systems a diversity of depths are necessary for shelter, foraging and migration of various life history stages (e.g. adult, sub-adult, juvenile).
- **Sediment quality.** Sediment quality (i.e., chemical characteristics) is necessary for normal behavior, growth, and the viability of all life history stages in freshwater riverine systems and estuarine areas. This includes sediments free of elevated levels of contaminants (e.g., selenium, PAHs, and organochlorine pesticides) that may adversely affect green sturgeon.

One unique PCE is essential for the conservation of green sturgeon in freshwater riverine areas.

- **Substrate type or size (i.e., structural features of substrates).** This PCE is primarily focused on successful spawning and incubation of eggs and includes substrates suitable for spawning, egg deposition and development, and larval development.

A.1.5 Eulachon (*Thaleichthys pacificus*)

Status

NOAA Fisheries was petitioned in 1999 to add Columbia River eulachon to the list of federally threatened and endangered species under the ESA. In November 1999, NMFS issued a finding that the petition did not present substantial scientific information indicating the petitioned action may be warranted (64 FR 66601; November 29, 1999). On November 8, 2007, NMFS received a petition from the Cowlitz Indian Tribe to list southern eulachon (populations in Washington, Oregon, and California) under the ESA. The Cowlitz Indian Tribe's petition sought delineation of a southern eulachon DPS extending from the U.S.-Canada border south to include populations in Washington, Oregon, and California. In March 2008, NMFS determined that the petition presented substantial scientific and commercial information indicating the petitioned action may be warranted, and initiated a status review. In March 2010, NMFS listed the Southern DPS of eulachon as threatened under the ESA (75 FR 13012; March 18, 2010).

Eulachon abundance exhibits considerable year-to-year variability. However, nearly all spawning runs from California to southeastern Alaska have declined in the past 20 years, especially since the mid 1990s. From 1938 to 1992, the median commercial catch of eulachon in the Columbia River was approximately 2 million pounds (900,000 kg) but from 1993 to 2006, the median catch had declined to approximately 43,000 pounds (19,500 kg), representing a nearly 98 percent reduction in catch from the prior period. Eulachon returns in the Fraser River and other British Columbia rivers similarly suffered severe declines in the mid-1990s and, despite increased returns during 2001 to 2003, presently remain at very low levels. The populations in the Klamath River, Mad River, Redwood Creek, and Sacramento River are likely "extirpated" or nearly so.

Habitat Requirements

Eulachon are endemic to the eastern Pacific Ocean, ranging from northern California to southwest Alaska and into the southeastern Bering Sea. In the continental United States, most eulachon originate in the Columbia River Basin. Other areas in the United States where eulachon have been documented include the Sacramento River, Russian River, Humboldt Bay and several nearby smaller coastal rivers (e.g., Mad River), and the Klamath River in California; the Rogue River and Umpqua Rivers in Oregon; and infrequently in coastal rivers and tributaries to Puget Sound, Washington.

Eulachon occur in nearshore ocean waters and to 1,000 feet (300 m) in depth, except for the brief spawning runs into their natal (birth) streams. They feed on plankton while at sea. Spawning grounds are typically in the lower reaches of larger snowmelt-fed rivers with water temperatures ranging from 39 to 50 o F (4-10 o C). Spawning occurs over sand or coarse gravel substrates.

Habitat loss and degradation threaten eulachon, particularly in the Columbia River basin. Hydroelectric dams block access to historical eulachon spawning grounds and affect the quality of spawning substrates through flow management, altered delivery of coarse sediments, and siltation. The release of fine sediments from behind a U.S. Army Corps of Engineers sediment retention structure on the Toutle River has been negatively correlated with Cowlitz River eulachon returns 3 to 4 years later and is thus implicated in harming eulachon in this river system, though the exact cause of the effect is undetermined. Dredging activities in the Cowlitz and Columbia rivers during spawning runs may entrain and kill fish or otherwise result in decreased spawning success.

Eulachon have been shown to carry high levels of chemical pollutants, and although it has not been demonstrated that high contaminant loads in eulachon result in increased mortality or reduced reproductive success, such effects have been shown in other fish species. Eulachon harvest has been curtailed significantly in response to population declines. However, existing regulatory mechanisms may be inadequate to recover eulachon stocks.

Global climate change may threaten eulachon, particularly in the southern portion of its range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success.

Conservation efforts include fishing restrictions and habitat improvements targeted to improve the status of eulachon, salmon, and other native species in Pacific Northwest streams.

Critical Habitat

Critical habitat has not been designated for eulachon as of October 2010.

A.1.6 Designated Critical Habitat for Salmon and Steelhead

On September 2, 2005, NMFS designated critical habitat in Washington, Oregon, Idaho, and California for 19 Pacific salmon ESUs and steelhead DPSs listed as threatened or endangered under the ESA (70 FR 52630). The critical habitat for the following list of salmon and steelhead has been designated in the coverage area:

- California Coastal Chinook salmon
- Central Valley Spring-Run Chinook salmon
- Northern California steelhead
- Central California Coast steelhead
- California Central Valley steelhead

As designated, critical habitat is defined as the lateral extent of the width of the stream channel as defined by its bankfull elevation. If the bankfull elevation is not evident on either bank, the ordinary high water mark (OHWM), as defined by the U.S. Army Corps of Engineers, is used to determine the lateral extent of critical habitat. In streams or areas where the OHWM is not defined, the width of the stream will be defined by the bankfull elevation (69 FR 74584).

Adjacent floodplains are not included as critical habitat. However, NMFS acknowledges that the quality of aquatic habitat in stream channels is intrinsically related to the character of the floodplains and associated riparian zones; similarly, human activities that occur outside the river channels can have demonstrable effects on physical and biological features of the aquatic environment (69 FR 74584).

The lateral extent of critical habitat in nearshore marine areas is defined as the area inundated by extreme high tide. It represents a regularly occurring intertidal fringe that is recognizable, and contains and influences habitat elements such as large wood, rocks and boulders, and aquatic vegetation. The habitat elements for nearshore marine areas are defined as areas being free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, capable of supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels. This zone also contains important marine vegetation and cover (e.g., eelgrass meadows and kelp forests) and in which salmon forage species reside (e.g., surf smelt and sand lance). Activities

potentially affecting PCEs in this zone include the construction of overwater structures (e.g., docks and piers), dredging, and bank armoring.

Critical habitat is broken down to the primary constituent elements (PCEs). The PCEs consist of those physical and biological components deemed essential for the conservation and recovery of the species, including space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, and rearing of offspring; and habitats that are protected from disturbance or are representative of the historical geographical and ecological distribution of a species (69 FR 74581).

A.2 Marine Mammals

A.2.1 Steller Sea Lion (*Eumetopias jubatus*)

Status

On April 10, 1990, the western population (located west of 144°W longitude) of Steller sea lions was designated as endangered. The eastern population (located east of 144°W longitude, including those sea lions found along the western U.S. coastline) was designated as threatened (55 FR 13488).

Habitat Requirements

The current range of Steller sea lions includes the northern Pacific Rim from northern Japan, through the Aleutian Islands and Bering Sea, along Alaska's southern coast, and south to California. Steller sea lions are not known to make regular migrations, but they do move considerable distances, with juvenile animals seen at the greatest distances from their rookery of birth (up to 1109 miles). Sightings of adults were generally less than 300 miles away from the natal rookery (National Marine Fisheries Service 2007a).

Steller sea lions breed, pup, and seek rest and refuge on relatively remote islands and points of land. Haulouts and rookeries tend to be preferentially located on exposed rocky shoreline and wave-cut platforms (Ban 2005, Call and Loughlin 2005, both in National Marine Fisheries Service 2007a). Some rookeries and haulouts are also located on gravel beaches. Rookeries are nearly exclusively located on offshore islands and reefs. Terrestrial sites used by Steller sea lions tend to be associated with waters that are relatively shallow and well-mixed, with average tidal speeds and gradual bottom slopes (Ban 2005 in National Marine Fisheries Service 2007a). When not on land, Steller sea lions are seen near shore and out to the edge of the continental shelf and beyond. Steller sea lions are opportunistic feeders, preying on schooling demersal fish such as walleye pollock, Atka mackerel, herring, and capelin. Declines in sea lion abundance may be related to changes in the availability of sea lion prey.

In California, the reason for the decline of Steller sea lions is not known. Former rookery habitat has been abandoned (San Miguel Island), and other rookeries (Año Nuevo Island, Farallon Islands) are at lower than historical abundance levels. The availability of suitable terrestrial habitat does not appear to be a factor in the sea lion decline in parts of California.

Critical Habitat

Critical habitat for Steller's sea lions was originally designated on August 27, 1993 (58 FR 45269). Critical habitat was designated to protect Steller sea lion essential habitat. Essential habitat is defined in 58 FR 45269 as the physical and biological habitat features that support reproduction, foraging, rest, and refuge. These features are essential to the conservation of the species, and include terrestrial, air, and aquatic areas. In California, critical habitat includes all major Steller sea lion rookeries and as well as an air zone that extends 3,000 feet above these areas, measured vertically from sea level, and an aquatic zone that extends 3,000 feet seaward in state- and federally-managed waters from the baseline or base point of each major rookery.

A.2.2 Blue Whale (*Balaenoptera musculus*)

Status

On June 2, 1970, the blue whale was listed as an endangered species (35 Federal Register [FR] 8491).

Habitat Requirements

Blue whale distribution is likely linked to nutritional requirements (Reilly and Thayer 1990, Schoenherr 1991, Kawamura 1994). Areas of cold, upwelling currents (i.e., eastern sides of the oceans) provide large quantities of the euphausiid crustaceans (krill) that are a primary prey item of blue whales. Areas of dense prey aggregations may be seasonal, year-round, or strongly influenced by the occurrence of El Niño Southern Oscillation (ENSO) events (Reilly and Thayer 1990, Schoenherr 1991, Gendron and Sears 1993). In the North Pacific, the krill species on which these whales rely include *Euphausia pacifica, Thysanoessa inermis, T. longipes,* and *T. spinifera* (Schoenherr 1991). Off the Pacific coast of Baja California, blue whales have been reported to feed on concentrations of the pelagic red crab, *Pleuroncodes planipes* (Rice 1978). Blue whales have also been observed between February and April in the Gulf of California feeding on surface swarms of *Nyctiphanes simplex*, a euphausiid species (Sears 1990, Gendron and Sears 1993). Sears (1990) regarded the latter species as the principal prey of blue whales in the region. Some researchers have speculated that a critical factor influencing blue whale recovery in the Southern Hemisphere may be interspecific competition with minke whales and krill predators other than whales (Fraser et al. 1992). However, no conclusions can be made about this type of competition until further behavioral and distributional information is collected (Mizroch et al. 1984a). Natural mortality rates are unknown, but are likely to be similar to those of the fin whale—about 4% per year in adult whales (Allen 1980).

Critical Habitat

Critical habitat has not been proposed or designated for the blue whale.

A.2.3 Humpback Whale (*Megaptera novaeangliae*)

Status

On June 2, 1970, the humpback whale was listed as an endangered species (35 FR 8491).

Habitat Requirements

Humpback whales in the Northern Hemisphere could be classified as dietary generalists. They have been known to prey upon krill (euphausiids); copepods; juvenile salmonids, *Oncorhynchus* spp.; Arctic cod, *Boreogadus saida*; walleye pollock, *Theragra chalcogramma*; pollock,

Pollachius virens; pteropods; and some cephalopods (Johnson and Wolman 1984). In New England waters of the North Atlantic, 95% of the humpback diet consists of fish species. The most common prey items are the Atlantic herring, *Clupea harengus*; capelin, *Mallotus villosus*; Atlantic mackerel, *Scomber scombrus*; and other schooling species (Kenney et al. 1985). On the Alaska feeding grounds in the North Pacific, krill, herring, and capelin make up the majority of prey items in the stomachs of humpback whales (Bryant et al. 1981, Dolphin and McSweeney 1983). Humpback whales generally do not feed when on their wintering grounds (Slijper 1962, Lockyer 1981).

Humpback whales use a wide range of feeding techniques, at times involving more than one individual and resembling a form of cooperative participation. The two most observable techniques are lob-tail feeding (Weinrich et al. 1992) and bubble-cloud feeding (Ingebrigtsen 1929, Jurasz and Jurasz 1979a, Hain et al. 1982). Recently, there has been documentation of bottom feeding by humpback whales on Stellwagen Bank off Massachusetts and near the mouth of Chesapeake Bay (Swingle et al. 1993, Hain et al. 1995)

Natural mortality rates have rarely been estimated for humpback whales and the causes of natural mortality in this species are not well known.

Critical Habitat

Critical habitat has not been proposed or designated for the humpback whale.

A.2.4 Fin Whale (*Balaenoptera physalus*)

Status

On June 2, 1970, the fin whale was listed as an endangered species (35 FR 8491).

Habitat Requirements

Fin whales spend the summer feeding in the relatively high latitudes of both hemispheres, particularly along the cold eastern boundary currents in the North Pacific and North Atlantic Oceans and in Antarctic waters of the Southern Hemisphere. They are most abundant in offshore waters where their primary prey (e.g. euphausiids) is concentrated in dense shoals. Fin whales may have a significant impact on marine ecosystems. As an example, the total annual (spring and summer) prey consumption by fin whales along the northeast U.S. continental shelf has been estimated at 664,000 tons per year (Hain et al. 1992). By biomass, fin whales in this area probably consume more food than any other cetacean species. It is assumed that fin whales undergo a partial or complete fast while traveling to lower latitudes in the fall and throughout the winter (Mizroch et al. 1984b).

The predominant prey of fin whales varies greatly in different geographical areas depending on what is locally abundant (International Whaling Commission 1992). For instance, in the Northern Hemisphere they consume schooling fishes, such as capelin, *Mallotus villosus;* anchovies, *Engraulis mordax*; herring, *Clupea harengus;* and sand lance, *Ammodytes* spp. (Mitchell 1975, Overholtz and Nicolas 1979, Kawamura 1982). Thus, they may be less prey selective than blue, humpback, and right whales. However, fin whales do depend to a large extent on the small euphausiids and other zooplankton species. In the Antarctic, they feed on krill, *Euphausia superba*, which occur in dense near-surface schools (Nemoto 1959). In the

North Pacific, *E. pacifica*, *Thysanoessa inermi*s, *T. longipe*s, and *T. spinifera* are the primary prey items. The natural mortality rate for fin whales ranges from 4 to 6% (Clark 1982, de la Mare 1985).

Critical Habitat

Critical habitat has not been proposed or designated for the fin whale.

A.2.5 Sei Whale (*Balaenoptera borealis*)

Status

On June 2, 1970, the sei whale was listed as an endangered species (35 FR 8491).

Habitat Requirements

Sei whales spend the summer feeding in the relatively high latitudes of both hemispheres, particularly along the cold eastern currents of the North Pacific and North Atlantic Oceans and in the Antarctic waters of the Southern Hemisphere. They range farther offshore than fin whales in search of prey concentrations. Sei whales are less prey-selective than fin whales. Sei whales consume primarily copepods, but they also prey on euphausiids and small schooling fishes when these species are locally abundant (Mizroch et al. 1984c). This species seems to have the greatest flexibility relative to other balaenopterids in their feeding strategies, using both “engulfing” and “skimming” to capture prey (Nemoto 1959). In the Southern Hemisphere, there is some evidence that sei whales may minimize direct interspecific competition with the blue, fin, and minke whales by foraging in warmer waters than do the latter species, by consuming a relatively wider variety of prey, and by arriving later on the feeding grounds than other baleen whales (Kawamura 1978, 1980, 1994; IWC 1992). Estimated annual natural mortality is 7.5%.

Critical Habitat

Critical habitat has not been proposed or designated for the sei whale.

A.2.6 Sperm Whale (*Physeter macrocephalus*)

Status

On June 2, 1970, the sperm whale was listed as an endangered species (35 FR 8491).

Habitat Requirements

The sperm whale’s primary prey consists of larger mesopelagic cephalopod and fish species, including the giant squid, *Architeuthis* sp. Approximately 40 species of cephalopods are consumed by sperm whales worldwide. In the North Pacific, the four most common prey items of sperm whales off central California are all cephalopod species (i.e. *Moroteuthi*s, *Gonatopsi*s, *Histioteuthi*s, and *Galiteuthi*s) (Fiscus et al. 1989). In the Indian Ocean, the cephalopod species most commonly eaten by sperm whales are of the Histioteuthid family (Gordon 1991). Sperm whales in the high latitudes of the North Atlantic (i.e., Norwegian Sea and Iceland) feed on deep-dwelling fish species of the genus *Cyclopterus* (lumpsuckers) and *Sebastes* (redfishes). Fish species account almost half of the total biomass eaten by sperm whales in this region, while the other half is comprised of cephalopods (Martin and Clarke 1986, Christensen et al. 1992).

Critical Habitat

Critical habitat has not been proposed or designated for the sperm whale.

A.3 Marine Reptiles

A.3.1 Leatherback Turtle *(Dermochelys coriacea)*

Status

The leatherback turtle was listed as endangered on June 2, 1970 (35 FR 8491).

Habitat Requirements

Leatherback turtles have a global distribution and occur in the Atlantic, Indian, and Pacific Oceans (Groombridge 1982). In the Pacific Ocean, this species has been recorded along the coast of South America and as far north as Alaska (Mager 1985). They are the most commonly sighted sea turtle in U.S. Pacific waters north of Mexico (Stinson 1984 in National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998).

Leatherback turtles feed on organisms living in the water column and attached to hard substrates. They eat primarily soft foods such as jellyfish and tunicates (Mager 1985, National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998).

The leatherback turtle breeds in the water and nests on long tropical beaches with a considerable slope and unobstructed deep water approach (Center for Environmental Education 1983). They usually nest in colonies on isolated mainland beaches in all tropical oceans. Nesting seasons vary according to location.

Little information is available on the migratory habits of this species. Leatherback turtles are generally associated with continental shelf habitats and pelagic environments. Their distribution also appears related to oceanic temperatures, with leatherback turtles observed north of central California during the summer and fall when sea surface temperatures are at their highest (Dohl et al. 1983, Brueggeman 1991, both in National Marine Fisheries Service and U.S. Fish and Wildlife Service 1998).

Critical Habitat

Critical habitat was proposed for this species on March 23, 1979 (44 FR 17711). No critical habitat has been designated in the coverage area.

A.3.2 Olive Ridley Turtle (*Lepidochelys olivacea*)

Status

The olive ridley turtle was listed as threatened on July 28, 1978 (43 FR 32800).

Habitat Requirements

The diet and feeding habits of the olive ridley turtle have not been substantially researched. Benthic crustaceans seem to constitute the majority of the prey items. Hatchlings and juveniles appear to have a pelagic phase in their development during which they are often found associated with floating objects in the Pacific Ocean southwest of Acapulco, Mexico. It is assumed that they remain in these areas until they have grown to a size that assures their safety while feeding in the nearshore feeding grounds with the adults. The most important nursery areas are found along the coast of Central America.

Critical Habitat

Critical habitat was proposed for this species on March 19, 1980 (45 FR 17588) but was never designated.

A.3.3 Loggerhead Turtle *(Caretta caretta)*

Status

The loggerhead turtle was listed as threatened on July 28, 1978 (43 FR 32800).

Habitat Requirements

Important developmental habitats for juvenile loggerhead turtles are found in coastal waters of the United States and Mexico. Benthic invertebrates constitute the primary diet of adult loggerhead turtles, but fish and plants are occasionally included.

Critical Habitat

Critical habitat was proposed for this species on October 4, 1978 (43 FR 45905) but was never designated. On November 16, 2007, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) initiated a review to determine if critical habitat should be designated in response to a petition from the Center for Biological Diversity and the Turtle Island Restoration Network (72 FR 64585).

A.3.4 Green Turtle (*Chelonia mydas*)

Status

Green turtles from the Florida and Mexico nesting populations were listed as endangered on July 28, 1978 (43 FR 32800). All other nesting populations of green turtles were listed as threatened on July 28, 1978 (43 FR 32800).

Habitat Requirements

Green turtles forage primarily on sea grasses and algae as adults. Diet varies among feeding grounds and may include a variety of marine animals. Specific foraging grounds for green turtles have not been identified, but are most likely located along the coast of Baja California (Mexico) and southern California (United States). Foraging grounds include bays and inlets (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1996). There are no data on foraging areas along the west coast of the United States (McDonald and Dutton 1990, McDonald et al. 1995). The feeding habits of juveniles and hatchlings are not known.

Critical Habitat

Critical habitat was designated on September 2, 1998 (63 FR 46694). No critical habitat has been designated in the coverage area.

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Appendix B Project Effect Determination and Categorization Forms

Appendix B

Project Effect Determination and Categorization Forms

Project Impact Analysis and Reporting

This appendix provides guidance on the procedures for evaluating and reporting the potential impacts of proposed projects. Figure 2-1 shows the Caltrans PBA project implementation process. For each project, the project is first characterized to identify the scope and nature of the project and what elements may result in impacts on covered species. The actual species that could be affected by the project are then identified, and an effects analysis is conducted to determine the level of effect (NE, NLTAA, or LTAA) the project would have on each species. Finally a project-level effect determination is made based on the greatest level of effect identified for the species affected. A project category (1, 2, 3, or 4) is then assigned to the project based on this determination and the level of reporting required for agency review, and project approval is identified. These four steps are described below.

I. Project Characterization

This section allows preliminary analysis of the general nature or the project. Many of Caltrans' projects are routine and will have no effect on covered species. Others may affect species, or not, depending on the activities involved, species present, prevailing ecological conditions, and season the project will occur. Finally some projects will always adversely affect covered species if they are present in the project action area. The objective of this section is to provide rapid preliminary assessment as to the category into which the project under consideration will fall. The level of effort required for subsequent impact analysis and reporting of the project will key from this information.

II. Avoidance and Minimization Conservation Measures

Refer to Section 5.2 to identify what BMPs/ABMPs will be implemented to avoid and minimize impacts on covered species.

III. Covered Species Impacts

To assess how (nature and extent) the project will affect listed species covered under this PBA, follow the impact assessment flowchart shown in Figure 2-2 to determine the effects of the project on each covered species in the project action area. In this section, provide an explanation and rationale (including BMPs/ABMPs implemented to avoid and minimize impacts on each covered species—see below) for each decision where additional information is warranted to avoid uncertainty or ambiguity. List the final effect determination (NE, NLTAA, or LTAA) for each species in the matrix.

IV. Project Effect Determination and Categorization

This section includes an impact analysis for each covered species affected or potentially affected by the proposed project. Based on the overall record, a project effect determination is made and the project is given a specific category ranking. If the determination for all covered species tentatively assigns the project to Category 1, still provide the analyses developed in this form to the reviewing agencies for approval of the category assigment and authorization under the programmatic consultation. Subsequent projects with identical characteristics, conditions, and species involved can be automatically categorized within this category and implemented with authorization allowed by procedural consensus. Projects with NLTAA or simple PBO-allowed LTAA determinations will be categorized as Category 2 projects and require a full effects analysis (i.e., this form) to be submitted to the reviewing agencies for each project to be implemented. Following agreement from the agencies, the project can be implemented. Finally all complex projects that require extended explanation and rationale for each impact analysis decision will merit an LTAA determination that will require a detailed summary of effects letter tiered from the conditions and constraints of the PBO to be submitted to the reviewing agencies for review, approval and project authorization. It the agencies do not agree with the determinations for either Category 2 or 3 projects, the project must be either modified to comply with the PBO requirements or be evaluated under separate consultation.

*Project Number:*_____

Caltrans Routine Maintenance and Repair Activity

Project Report Form

I. Project Characterization

Project Name: _____

Project Manager: _____

Caltrans Office: _____

Project General Description:

_____

_____

_____

Location: Caltrans District :_____ ____County: _____

Watershed: _____Stream Name_____

SR _____ Start MP _____ End MP _____ Work Order _____

T _____ R _____ S _____ 1/4S _____ USGS Quad Name:_____

Map/photo/Google Earth image showing Project Action Area attached? _____

Schedule: Start: _____ _____ _____ End Date: _____ _____ _____

Day Mo. Yr. Day Mo. Yr

Project Actions

_____ PA-1 Operate construction equipment and vehicles

_____ PA-2 Use temporary lighting for night construction activities

_____ PA-4 Clean the roadway of sediment and debris during and following maintenance and construction activities

_____ PA-5 Temporarily and Permanently store sediment and debris and pavement, petroleum products, concrete, and other construction materials

_____ PA-6 Apply pavement, petroleum products, concrete, and other construction materials to the surface of roads, bridges, and related infrastructure

_____ PA-7 Treat and discharge water conveyed from the construction area
_____ PA-8 Use drill rigs and drilling lubricants
_____ PA-9 Paint, Wash, Seal, and Caulk bridges, guardrails, and other infrastructure
_____ PA-10 Remove and disturb upland, riparian and wetland vegetation
_____ PA-11 Grade and establish temporary and permanent storage areas for sediment, debris, and construction materials
_____ PA-12 Construct sediment-settling basins
_____ PA-13 Grade temporary access roads, traffic detours, staging and work areas
_____ PA-14 Operate construction equipment and vehicles in the stream channel
_____ PA-15 Construct Temporary Stream Crossings
_____ PA-16 Remove and disturb aquatic vegetation, stream sediment, and large woody debris
_____ PA-17 Install temporary cofferdams and diversion cofferdams
_____ PA-18 Temporarily Redirect stream flow
_____ PA-19 Temporary draft of water from streams and other water bodies
_____ PA-20 Install permanent and temporary Rock slope protection (RSP), sheet piles, and retaining walls
_____ PA-21 Place concrete and concrete slurry seal coat in cofferdams, footing and bridge forms, culvert bedding, and other applications
_____ PA-22 Remove culverts
_____ PA-23 Clean, retrofit and /or install culverts
_____ PA-24 Install fishways and/or stream gradient control structures
_____ PA-25 Remove existing bridge structure, including footings, piers, and piles
_____ PA-26 Install bridge structure
_____ PA-27 Drive temporary and permanent pilings and bridge piers
_____ PA-28 Blast rock and other substrate
_____ PA-29 Capture, handle, exclude, salvage, and relocate listed species
_____ PA-30 Implement Best Management Practices

Vehicles:

(List)_____
_____
_____

Equipment:

(List)_____
_____
_____
_____
_____
_____
_____

Specific Project Actions

Will **blasting** be required? Yes _____ No. _____ Type:_____

If yes, describe work and timing of work:

_____
_____
_____
_____

Will the project involve **other noise sources**? Yes _____ No. _____

If yes, describe the noise sources and approximate noise level (e.g., dBA levels):

_____
_____
_____
_____

Will artificial **lights** be used ? Yes _____ No. _____ Type:_____

Will the project involve **in-stream work**? Yes ____ No. _____

If yes, describe work and timing of work:

_____
_____
_____
_____
_____

Will the project affect any other water bodies (e.g. ponds, vernal pools)? Yes ____ No. _____

If yes, describe work and timing of work:

_____
_____
_____
_____
_____

Will the project alter the hydrology of the affected water body? Yes ____ No. _____

If yes, in what ways? Quantity _____Quality _____Rate _____Duration _____Hydrodynamics

Describe the hydrological changes:

_____
_____
_____
_____
_____

If yes, describe work and timing of work:

_____
_____
_____
_____
_____

Will the project create new impervious surface? _____ Yes ____ No.

If yes, how much new impervious surface will the project create? _____

Will the project require vegetation removal ? _____ Yes ____ No.

Describe the vegetation in the project area:

Ecological Section:_____

Deciduous forest _____% Coniferous Forest _____% Mixed Forest _____%

Riparian _____% Wetland _____% Shrub/Meadow _____% Bare ____% Developed _____%

Describe the specific vegetation communities at the project site:

_____
_____
_____
_____
_____

Will the project involve removal of vegetation? _____ Yes ____ No.

Will vegetation within 300 feet of any water body be removed? _____ Yes ____ No.

If yes, is the vegetation part of a riparian corridor? _____ Yes ____ No.

Describe type and extent of vegetation removal:

Trees:_____
Shrubs:_____

Herbaceous:_____
_____

Will trees > 6 inches dbh be removed within 300 feet of a water body? _____ Yes ____ No.

If yes, describe the species, amount and size of trees to be removed:
_____
_____
_____
_____

Describe the impacts to the riparian habitat:
_____
_____
_____
_____
_____

Identify the amount of riparian habitat to be impacted:_____acres

Will grading of filling occur within 300 feet of a waterbody? _____ Yes ____ No.

Total amount of grading, clearing and filling: _____acres.

What is the erosion potential of the exposed soils? _____High_____Medium _____Low.

Will bare soils be revegetated or hydroseeded after construction? _____ Yes ____ No.

Describe;_____

Will trees or shrubs be planted _____ Yes ____ No.

Describe: _____

Will wetlands be impacted? _____ Yes ____ No.

If yes, identify the area of impact: _____acres.

Do impacted wetlands provide suitable habitat for listed plants, fish or wildlife (e.g. vernal pool crustaceans)? _____ Yes ____ No.

If yes, identify which species could be affected:
_____
_____
_____

V. Avoidance and Minimization Conservation Measures

Use Section 5.2 to identify what BMPs/ABMPs that will be implemented to avoid and minimize impacts to covered species.

BMPs/ABMPs to be Applied: (List: See Table 5-1 for Codes)

_____
_____
_____
_____
_____
_____
_____

VI. Covered Species Impacts

Determine if any covered species listed in the following table will be present in the site-specific area and whether they will be affected by the project. Check off which species will occur or potentially could occur within project area during construction and which of the listed effects could potentially occur. Provide details on each of these effects in the appropriate sections following this table. Based on those details, make an effect determination for each species that would be affected by the project. Refer to Figure 2-2 and Chapter 7 for guidance on making these determinations.

Covered Species	Present During Project?	Direct Mortality	Indirect Mortality	Noise Disturbance	Activity Disturbance	Light Disturbance	Habitat Removal	Habitat Modification	Effect Determination
Fish									
Eulachon									
Southern DPS									
Chinook Salmon									
California Coastal ESU									
Sacramento River Winter-Run ESU									
Central Valley Spring-Run ESU									
Coho Salmon									
Central California ESU									
Southern Oregon/Northern California ESU									
Steelhead									
Northern California DPS									
Central California Coast DPS									
California Central Valley DPS									
Green Sturgeon									
Southern DPS									

Covered Species	Present During Project?	Direct Mortality	Indirect Mortality	Noise Disturbance	Activity Disturbance	Light Disturbance	Habitat Removal	Habitat Modification	Effect Determination
Marine Mammals									
Steller Sea Lion									
Blue Whale									
Humpback Whale									
Fin Whale									
Sei Whale									
Sperm Whale									
Reptiles									
Leatherback Sea Turtle									
Olive Ridley Sea Turtle									
Loggerhead Sea Turtle									
Green Sea Turtle									

VII. Project Effect Determination and Categorization

Project Impact Analysis

VIII. Direct Mortality:

Will there be any unavoidable direct mortality to any covered species? Yes ____ No _____

If yes, identify the species, age group, sex and estimated number of individuals that will be killed and describe the source of their mortality:

_____
_____
_____
_____
_____
_____
_____
_____

IX. Indirect Mortality:

Will there be any indirect mortality to any covered species? Yes ____ No _____

If yes, identify the species, age group, sex and estimated number of individuals that will be killed and describe the source of their mortality:

_____
_____
_____
_____
_____
_____
_____
_____

Noise Disturbance:

Will there be any unavoidable noise disturbance to any covered species? Yes ____ No _____

If yes, identify the noise source(s) and species, age group, sex and estimated number of individuals that would be affected by the noise. Describe the proximity of the covered species to the noise source:

_____
_____
_____
_____
_____
_____
_____
_____

Activity Disturbance:

Will there a high level of construction activity that could cause visual disturbance of any covered species? Yes ____ No _____

If yes, describe the activity, what species would potentially be affected, how they could be affected, and the approximate distance the species would be to the activity:

_____
_____
_____
_____
_____
_____
_____
_____

Light Disturbance:

Will there any covered species that could potentially be impacted by the use of artificial lights during construction? Yes ____ No _____

If yes, describe what species would potentially be affected, how they could be affected, and the approximate distance the species would be to the lighting:

_____
_____
_____
_____
_____
_____
_____
_____

X. Habitat Loss and Modification

Will the project involve activities that will result in the loss or modification of crucial habitat to a covered species? Yes ____ No _____

If yes, describe how and to what extent the habitat would be lost/modified for each species affected. Compare to the environmental baseline information below:

_____
_____
_____
_____
_____
_____
_____
_____

XI. Environmental Baseline:

Describe whether the following resources are properly functioning based on NMFS pathways and indicators matrix (NMFS 1996). Additional information should be included on a separate page.

Aquatic Resources:
Describe the environmental baseline for water quality in the action area, including temperature, sediment, and chemical contaminants/nutrients:

_____
_____
_____

Describe the environmental baseline for habitat access in the action area, including any physical barriers:

_____
_____

Describe the environmental baseline for habitat elements in the action area, including substrate, large woody debris (LWD), pool frequency, pool quality, off-channel habitat, and refugia:

_____
_____
_____

Describe the environmental baseline for channel conditions and dynamics, including width:depth ratio, streambank condition, and floodplain connectivity:

_____
_____
_____

Describe the environmental baseline for flow/hydrology, including peak/base flows and drainage network increases:

_____
_____

Terrestrial Resources:
Describe the environmental baseline for the watershed and upland condition, including disturbance history, riparian reserves, and upland habitat:

_____
_____
_____

Effects Determinations

Using the effect criteria described for each covered species in Chapter 7 and the information developed above, determine the level of effect the project will have on each species. These determinations will include one of the following:

- No Effect (NE)
- May Affect, Not Likely to Adversely Affect (NLTAA)
- May Affect, Likely to Adversely Affect (LTAA)

Determine the project level effect determination based on the greatest level of effect for any species affected. For example, if one species has an LTAA determination and the other species have NTLAA or NE, the project level determination would be LTAA. Based on this determination, categorize the project according to the levels described in Figure 2-1 and determine the required level of reporting for the project. They are as follows:

- Category 1: No covered species affected or No Effect determination for project. Retain this report in appropriate project file for reference for the annual project report. Implement project. Use No Effect Project Notification Form (attached) for NMFS notification if mutually agreed upon.

- Category 2: Not Likely to Adversely Affect or Likely to Adversely Affect covered species but take is authorized by the PBA Biological Opinion. Submit this completed report to NMFS as appropriate. Implement project upon approval from regulatory agency.

- Category 3: Likely to Adversely Affect covered species. Submit this completed report to NMFS along with a detailed Summary of Effects letter tiered off the conditions and constraints of the PBO. Implement project upon approval from regulatory agency.

- Category 4: Likely to Adversely Affect Listed species not covered by PBA affected; Level of take exceeds that provided in PBA Biological Opinion. Separate Biological Assessment required.

*Project Number:*_____

Project Effect Determination: (circle**) NE NLTAA LTAA**

Project Category: (circle) 1 2 3 4

Report Completed:: ____ ____ ____
Day Mo. Yr.

Report Completed by:_____

Signature: _____

NMFS Notified: ____ ____ ____ _____
Day Mo. Yr. Initials

USFWS Notified: ____ ____ ____ _____
Day Mo. Yr. Initials

Project Completed : ____ ____ ____ _____
Day Mo. Yr. Initials

*Project Number:*_____

Follow-up Status Report.

(Provide details on success of project or any unexpected conditions/results that are important in evaluating the Effect Determination or Project Categorization)

*Project Number:*_____

Caltrans Routine Maintenance and Repair Activity

No Effect Project Notification Form

XII.

Project Name: _____

Project Action:

_____

_____

_____

Date _____ Author: _____

Office: _____Title: _____

Location: Caltrans District :_____ ____County: _____

Watershed: _____Stream Name_____

SR _____ Start MP _____ End MP _____ Work Order _____

T _____ R _____ S _____ 1/4S _____ USGS Quad Name:_____

Map/photo/Google Earth image showing Project Action Area attached? _____

Schedule: Start: _____ _____ _____ End Date: _____ _____ _____

Day Mo. Yr. Day Mo. Yr

XIII. Covered Species:

_____

XIV. No Effect Determination Justification:_____

XV. _____
_____
_____

XVI. _____
_____
_____

XVII. _____
_____

Appendix C Best Management Practices

Appendix C Best Management Practices

Standard BMPs are listed in alphabetical order. The numbering convention assigned to them in the Caltrans *Storm Water Quality Handbook, Maintenance Staff Guide* (May 2003) and *Caltrans Storm Water Quality Handbook, Construction Site Best Management Practices Manual* (March 2003) appears in parentheses following the title of the BMP. ABMPs are listed in order by the associated "project action" number.

C.1 Standard Best Management Practices

C.1.1 Construction Site Best Management Practices[1]

Check Dam (SC-4)

Description

A check dam is a small device constructed of rock or gravel bags placed across a natural or man-made channel or drainage ditch. Erosion of the drainage ditch is reduced by restricting the velocity of flow in the ditch.

Appropriate Applications

Check dams may be installed in small open channels that drain 4 hectares (ha) or less, in steep channels where runoff velocities exceed 1.5 meters per second (m/s), during the establishment of grass linings in drainage ditches or channels, or in temporary ditches where the short length of service does not warrant the establishment of erosion-resistant lining.

- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.
- Not to be used in live streams.
- Not appropriate in channels that drain areas greater than 4 ha (10 acres).
- Not to be placed in channels that are already grass lined.
- Not to be constructed from straw bales or a silt fence.

Implementation

- Check dams shall be placed at a distance and height to allow small pools to form behind them.
- For multiple check dam installation, backwater from downstream check dam shall reach the toe of the upstream dam.
- High flows (typically, a two-year storm or larger) shall safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams shall be removed when the grass has matured sufficiently to protect the ditch or swale.
- A sump shall be provided immediately upstream of the check dam for the purpose of capturing excessive sediment.

- A conceptual rock check dam is shown in Figure 4-6 of the *Guidelines.*

Maintenance
Remove sediment when depth reaches one-third of the check dam height.

Clear Water Diversion (NS-5)
Description
Clear water diversion consists of a system of structures and measures that intercept clear surface water runoff upstream of a project site, transport it around the site and discharge it downstream with minimal water quality degradation for either the project construction operations or the construction of the diversion. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains, drainage and interceptor swales.

Appropriate Applications
A clear water diversion is typically implemented where appropriate permits (1601 Agreement) have been secured and work must be performed in a live stream or water body.

Implementation
- Heavy equipment driven in wet portions of a water body to accomplish work shall be completely clean of petroleum residue, and water levels shall be below the gear boxes of the equipment in use or equipment lubricants and fuels shall be sealed such that inundation by water shall not result in leaks.
- Mechanical equipment operated in the water shall not be submerged to a point above any axle of said mechanical equipment.
- Excavation equipment buckets may reach out into the water for the purpose of removing or placing fill materials. Only the bucket of an excavator/backhoe may operate in water-covered portions of a water body. The main body of the crane/excavator/backhoe shall not enter water-covered portions of a water body, except as necessary to cross the stream to access the work site.
- Stationary equipment (such as motors and pumps) located within or adjacent to a water body shall be positioned over drip pans.
- When any artificial obstruction is being constructed, maintained or placed in operation, sufficient water shall at all times be allowed to pass downstream to maintain aquatic life downstream.
- The exterior of vehicles and equipment that will encroach on water body within the project shall be maintained free of grease, oil, fuel and residues.
- Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. Precautions shall be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation shall be replaced with the appropriate soil stabilization measures.
- Riparian vegetation, when removed pursuant to the provisions of the work, shall be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation shall be covered by a sufficient layer of clean river run cobble to prevent

damage to the underlying soil and root structure. The cobble shall be removed upon completion of project activities.

- Drip pans shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.

Maintenance

Check embankments and diversion for damage to the linings, accumulating debris, sediment buildup and adequacy of the slope protection. Remove debris and repair linings and slope protection as required.

Concrete Finishing (NS-14)[2]

Description

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Proper procedures minimize the impact that concrete finishing methods may have on runoff.

Appropriate Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

Limitations

Specific permit requirements may be included in the contract documents for certain concrete finishing operations.

Implementation

- Follow containment requirements stated in the project special provisions, if any.
- Collect and properly dispose of water and solid waste from high-pressure water blasting operations.
- Collect water from blasting operations and transport or dispose of water in a non-erodible manner. Refer to BMPs SS-9, “Earth Dikes/Drainage Swales & Lined Ditches,” SS-10, “Outlet Protection/Velocity Dissipation Devices,” and SS-11, “Slope Drains.”
- Direct water from blasting operations away from inlets and watercourses to collection areas for removal (e.g., dewatering) as approved in advance by the RE and in accordance with applicable permits.
- Protect inlets during sandblasting operations. Refer to BMP SC-10, “Storm Drain Inlet Protection.”
- Refer to BMP WM-8, “Concrete Waste Management”
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.

- When blast residue contains a potentially hazardous waste, refer to BMP WM-6, “Hazardous Waste Management”

Maintenance and Inspection

- Follow inspection procedure as required in the project special provisions.
- At a minimum, inspect containment structures, if any, for damage or voids prior to use each day and prior to the onset of rain.
- At the end of each work shift, remove and contain the liquid and solid wastes from containment structures, if any, and from the general work area.
- Discharges to waterways shall be reported to RE immediately upon discovery. A written discharge notification must follow within 7 days or as required by special provisions.

Concrete Waste Management (WM-8)

Description

Concrete waste management procedures and practices are designed to minimize or eliminate the discharge of concrete waste materials to storm drain systems or watercourses.

Appropriate Applications

Concrete waste management practices are typically implemented on construction projects where concrete is used as a construction material or where concrete dust and debris result from demolition activities.

Implementation

- Portland cement concrete and asphalt concrete waste shall not be allowed to enter storm water drainages or watercourses.
- Portland cement concrete waste shall be collected and properly disposed of or placed in a temporary concrete washout facility as shown conceptually in Figure 4-14 of the *Guidelines*.
- Asphalt concrete waste shall be collected and properly disposed of.
- A sign shall be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities.
- Below-grade concrete washout facilities are typical. Above-grade facilities are used if excavation is not practical.
- A foreman and/or construction supervisor shall monitor on-site concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.

Maintenance

A foreman and/or construction supervisor shall monitor on-site concrete waste storage and disposal procedures.

Contaminated Soil Management (WM-7)

Description

These are procedures and practices to minimize or eliminate the discharges of pollutants from contaminated soil to drainage systems or watercourses.

Appropriate Applications

Contaminated soil management is typically implemented on construction projects in highly urbanized or industrial areas where soil pollution may have occurred due to spills, illicit discharges or leaks from underground storage tanks. Contaminated soil management may also apply to highway widening projects in older areas where median and shoulder soils may have been contaminated by aerially deposited lead.

Implementation

Identifying Contaminated Areas

- Contaminated soils are often identified during project planning and development. Known locations of contaminated soils are identified in the plans and specifications.

Education

- Prior to performing any excavation work at locations identified as containing material classified as hazardous, employees and subcontractors shall complete a safety training program that meets the requirements of 29 CFR 1910.120 and 8 CCR 5192.
- Employees and subcontractors shall be educated and instructed in the identification of contaminated soil and on contaminated soil handling and disposal procedures.
- Meetings to discuss and reinforce disposal procedures shall be held or incorporated into regular safety meetings.

Handling Procedures for Material with Aerially Deposited Lead

- Materials from areas designated as containing aerially deposited lead may, if allowed by the contract, be excavated, transported and used in the construction of embankments and/or backfill.
- Excavation, transportation and placement operations shall result in no visible dust. Methods shall be employed to prevent spillage of lead-containing material during transport. Air quality shall be monitored during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- To minimize on-site storage, contaminated soil shall be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22 CCR, Section 66265.250 to 66265.260.
- Test suspected soils at a Caltrans-approved certified laboratory.
- If the soil is contaminated, work with the local regulatory agencies to develop options for treatment and/or disposal. Avoid temporary stockpiling of contaminated soils or hazardous material.
- If temporary stockpiling is necessary:

  - Cover the stockpile with plastic sheeting or tarps. Soil binders may also be used in lieu of tarping.
  - Install a berm around the stockpile to prevent runoff from leaving the area.
  - Do not stockpile in or near storm drains or watercourses.
- Contaminated material and hazardous material on the exterior of a transport vehicle shall be removed and placed either into the current transport vehicle or the excavation prior to the vehicle leaving the exclusion zone.
- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.
- Procure all permits and licenses, pay all charges and fees and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.
- Collect water from decontamination procedures and dispose of at an appropriate disposal site.
- Collect nonreusable protective equipment after use by any personnel and dispose of at an appropriate disposal site.
- Excavation, transport, and disposal of contaminated material and hazardous material shall be in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):
  - United States Department of Transportation (USDOT);
  - United States Environmental Protection Agency (USEPA);
  - California Environmental Protection Agency (Cal/EPA);
  - California Division of Occupation Safety and Health Administration (Cal/OSHA); and
  - Local regulatory agencies.

Procedures for Underground Storage Tank Removals

- As directed by the RE, arrange to test any liquid or sludge found in the underground tank prior to its removal to determine if it contains hazardous material.
- After tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representatives.
- The underground storage tank, any liquid and/or sludge found within the tank, and all contaminated material and hazardous material removed during the tank removal shall be transported to disposal facilities permitted to accept such material.

Water Control

- Take all necessary precautions and preventive measures to prevent the flow of water, including groundwater, from entering hazardous material or underground storage tank

excavations. Such preventative measures may consist of, but are not limited to, berms, cofferdams, grout curtains, freeze walls, seal course concrete or any combination thereof.

- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, shall be discharged to clean, closed top, watertight, transportable holding tanks, and disposed of in accordance with federal, state, and local laws.

Maintenance

A foreman and/or construction supervisor shall monitor on-site contaminated soil storage and disposal procedures.

Dewatering Operations (NS-2)

Description

Dewatering Operations are practices that manage the discharge of pollutants when non-storm water and accumulated precipitation must be removed from a work location so that construction work may be accomplished.

Appropriate Applications

- These practices are implemented for discharges of non-storm water from construction sites. Non-storm waters include, but are not limited to, groundwater, water from cofferdams, water diversions, and waters used during construction activities that must be removed from a work area.
- Practices identified in this section are also appropriate for implementation when managing the removal of accumulated precipitation (storm water) from depressed areas at a construction site.

Implementation

- Dewatering non-storm water cannot be discharged without prior notice and approval from the appropriate Regional Water Quality Control Board. This includes storm water that is co-mingled with groundwater or other non-storm water sources. Once the discharge is allowed, appropriate BMPs must be implemented to ensure the discharge complies with all permit requirements.
- The RWQCB may require a separate NPDES permit prior to the dewatering discharge of non-storm water. These permits will have specific testing, monitoring, and discharge requirements and can take significant time to obtain.
- Except in RWQCB Regions 1 and 2, the discharge of accumulated precipitation (storm water) to a water body or storm drain is subject to the requirements of Caltrans NPDES permit. RWQCB Regions 1 and 2, require notification and approval prior to any removal of water from construction sites. Sediment control and other appropriate BMPs must be employed when this water is discharged.
- The flow chart shown in Figure 4-15 of the *Guidelines* shall be utilized to guide dewatering operations.
- The RE will coordinate monitoring and permit compliance.

- Discharges must comply with regional and watershed-specific discharge requirements.
- Additional permits or permissions from other agencies may be required for dewatering cofferdams or diversions.
- Dewatering discharges must not cause erosion at the discharge point.

Maintenance

- Inspect all BMPs implemented to comply with permit requirements frequently and repair or replace to ensure the BMPs function as designed.
- Accumulated sediment removed during the maintenance of a dewatering device may be either spread on site and stabilized or disposed of at a disposal site as approved by the RE.
- Accumulated sediment that is commingled with other pollutants must be disposed of in accordance with all applicable laws and regulations and as approved by the RE.

Earth Dikes/Drainage Flow Conveyance Controls (SS-9)

Description

These are structures that intercept, divert and convey concentrated surface runoff, generally sheet flow, to prevent erosion.

Appropriate Applications

- These structures may be used to convey surface runoff down sloping land; to intercept and divert runoff to avoid sheet flow over sloped surfaces; and to direct runoff towards a stabilized watercourse, drainage pipe or channel. Also, these structures may be used below steep grades where runoff begins to concentrate and along roadways and facility improvements subject to flood drainage.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.
- These structures are not suitable as sediment-trapping devices.

Implementation

- Care must be applied to correctly size and locate earth dikes, drainage swales and lined ditches. Excessively steep, unlined dikes and swales are subject to erosion and gully formation.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, overtopping, flow backups, washout and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- When possible, install and utilize permanent dikes, swales and ditches early in the construction process.
- Provide stabilized outlets.

- A conceptual diversion ditch/drainage swale and a conceptual diversion berm/earth dike are shown in Figure 4-9 of the *Guidelines*.

Maintenance

- Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.
- Check the channel lining, embankments, and bed for erosion and accumulating debris and sediment buildup. Remove debris and repair linings and embankments as required.

Fiber Rolls (SC-5)

Description

A fiber roll consists of straw, flax, or other similar materials that are rolled or bound into a tight tubular roll and placed on the face of slopes at regular intervals to intercept runoff, reduce its flow velocity, release the runoff as sheet flow and provide some removal of sediment from the runoff.

Appropriate Applications

- Fiber rolls shall be implemented in conformance with the criteria presented in Section 4.3.4.
- May be used along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
  - For slope inclinations between 1:20 and 1:2: BMPs shall be placed on slopes 30m and greater at intervals no greater than 15m; and
  - Slope inclination 1:2 or greater: BMPs shall be placed on slopes 15m and greater at intervals no greater than 7.5m.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.

Implementation

- Fiber roll materials are either:
  - Prefabricated rolls; or
  - Rolled tubes of erosion control blanket.
- Assembly of field-rolled fiber roll
  - Roll length of erosion control blanket into a tube.
  - Bind roll at each end and along length of roll with jute-type twine.
- Installation
  - Install fiber rolls on level contours.
  - Stake fiber rolls into a trench.

A conceptual fiber roll installation is shown in Figure 4-5 of the *Guidelines*.

Maintenance
Repair or replace split, torn, unraveling, or slumping fiber rolls.

Geotextiles, Mats/Plastic Covers and Erosion Control Blankets (SS-7)
Description
This BMP involves the placement of geotextiles, mats, plastic covers or erosion control blankets to stabilize disturbed soil areas.

Appropriate Applications
These measures are typically used where disturbed soils may be particularly difficult to stabilize, including steep slopes (greater than 1:3 [vertical:horizontal]), slopes where erosion hazard is high, slopes where mulch must be anchored, disturbed areas where plants are slow to develop, channels with flows exceeding approximately 1.0 m/s and in channels to be vegetated.

Implementation
Illustrations of conceptual geotextiles, mats/plastic covers, and erosion control blankets are shown in Figure 4-8 of the *Guidelines*.

Maintenance
- Check for erosion and undermining. Any failures shall be repaired immediately.
- If washout or breakages occur, re-install the material after repairing the damage to the slope or channel.

Hazardous Waste Management (WM-6)
Description
Hazardous waste management procedures and practices are designed to minimize or eliminate the discharge of pollutants from construction site hazardous waste to storm drain systems or watercourses.

Appropriate Applications
Hazardous waste management practices are typically implemented on construction projects that generate waste from the use of petroleum products, asphalt products, concrete curing compounds, pesticides, palliatives, acids, septic wastes, paints, solvents, wood preservatives, stains, roofing tar and any materials deemed a hazardous waste in California.

Implementation
- Wastes shall be stored in sealed containers constructed of a suitable material and shall be labeled as required by Title 22 of the California Code of Regulations (CCR), Division 4.5 and 49 CFR Parts 172,173, 178, and 179.
- All hazardous waste shall be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR Parts 261–263.
- Waste containers shall be stored in temporary containment facilities.
    1. A temporary containment facility shall provide for a spill containment volume able to contain precipitation from a 24-hour, 25-year storm event, plus the greater of 10% of the

aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.

2. A temporary containment facility shall be impervious to the materials stored there for a minimum contact time of 72 hours.
3. A temporary containment facility shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be placed into drums after each rainfall. These liquids shall be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids shall be sent to an approved disposal site.
4. Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.
5. Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.
6. Each temporary containment facility shall be covered during nonworking days and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

- Drums shall not be overfilled and wastes shall not be mixed.
- Unless watertight, containers of dry waste shall be stored on pallets.
- Waste shall be disposed of properly within 90 days of being generated.
- To minimize on-site storage, full containers of waste shall be disposed of properly and promptly in accordance with all applicable regulations. In no case shall hazardous waste storage exceed the requirements in Title 22 CCR, Section 66262.34.
- Paint brushes and equipment for water- and oil-based paints shall be cleaned within a contained area and shall not be allowed to contaminate site soils, a watercourse or drainage system. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused shall be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials and drop cloths can be disposed of as solid waste.

Maintenance

A foreman and/or construction supervisor shall monitor on-site hazardous waste storage and disposal procedures.

Hydraulic Mulch (SS-3)

Description

Hydraulic mulch is an erosion control measure that consists of applying a mixture of shredded wood fiber and tackifier with hydro-mulching equipment.

Appropriate Applications

Hydraulic mulch is typically applied to disturbed areas requiring temporary protection until permanent vegetation is established or disturbed areas that must be re-disturbed following an

extended period of inactivity. Avoid use in areas where the mulch would be incompatible with future earthwork activities and would have to be removed.

Implementation

- Typical application rates are 1,500 pounds per acre.
- Prior to application, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Track walking should only be used where rolling is impractical.
- Avoid mulch over-spray onto the traveled way, sidewalks, lined drainage channels, or existing vegetation.

Maintenance

Maintain an unbroken, temporary mulched ground cover throughout the period of construction when the soils are not being reworked. Repair any damaged ground cover and re-mulch exposed areas of soil.

Hydroseeding/Handseeding (SS-4)

Description

Hydroseeding typically consists of applying a mixture of wood or paper fiber, seed, fertilizer and stabilizing emulsion with hydro-mulch equipment.

Appropriate Applications

Hydroseeding is typically applied on disturbed areas requiring temporary protection until permanent vegetation is established or disturbed areas that must be re-disturbed following an extended period of inactivity.

Implementation

- Hydroseeding may be used alone only when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control. Otherwise, hydroseeding must be used in conjunction with mulching (i.e., straw mulch).
- Avoid use in areas where the BMP would be incompatible with future earthwork activities and would have to be removed.
- Prior to application, roughen embankment and fill areas.
- Hydroseeding can be accomplished using a multiple-step or one-step process. The multiple-step process ensures maximum direct contact of the seeds to soil. When the one-step process is used to apply the mixture of wood fiber, seed, etc., the seed rate shall be increased to compensate for all seeds not having direct contact with the soil.
- Avoid mulch over-spray onto the traveled way, sidewalks, lined drainage channels, or existing vegetation.

Maintenance

- All seeded areas shall be checked for failures and re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.

- Any temporary revegetation efforts that do not provide adequate cover within 30 days of planting must be revegetated within 40 days of the initial installation.

Liquid Waste Management (WM-10)

Description

Liquid waste management procedures and practices are designed to prevent the discharge of pollutants to storm drain systems or water courses as a result of the creation, collection, or disposal of nonhazardous liquid.

Appropriate Applications

Liquid waste management is typically applicable to construction projects that generate any of the following nonhazardous byproducts, residuals or wastes: drilling slurries and drilling fluids; grease-free and oil-free wastewater and rinse water; dredging; and other non–storm water liquid discharges not permitted by separate permits.

Implementation

- Drilling residue and drilling fluids shall not be allowed to enter storm drains or watercourses and shall be properly disposed of.
- If an appropriate location is available, as determined by the RE, drilling residue and drilling fluids that are exempt under 23 CCR §2511(g) may be dried by infiltration and evaporation in a temporary concrete washout facility.
- See Section 4.5.11 of the *Guidelines*, Materials Handling, for appropriate handling and storage of liquid wastes.

Maintenance

- Spot-check employees and subcontractors throughout the duration of construction to ensure appropriate practices are being implemented.
- Remove deposited solids in containment areas and capturing devices as needed and at the completion of the task.
- Check containment areas and capturing devices frequently for damage and repair as needed.

Material Delivery and Storage (WM-1)

Description

Material delivery and storage procedures and practices are designed for the proper handling and storage of materials in a manner that minimizes or eliminates the discharge of these materials to storm water drainage systems or watercourses.

Appropriate Applications

These procedures are typically implemented at all construction sites with delivery and storage of pesticides, fertilizers, detergents, plaster, petroleum products, asphalt and concrete components, hazardous chemicals, concrete compounds or other materials that may be detrimental if released to the environment.

Implementation

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be stored in approved containers and drums and shall not be overfilled. Containers and drums shall be placed in temporary containment facilities for storage.
    1. A temporary containment facility shall provide for a spill containment volume able to contain precipitation from a 24-hour, 25-year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
    2. A temporary containment facility shall be impervious to the materials stored there for a minimum contact time of 72 hours.
    3. A temporary containment facility shall be maintained free of accumulated rainwater and spills. In the event of soil spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as a hazardous waste unless testing determines to be non-hazardous. Non-hazardous liquids shall be sent to an approved disposal site.
    4. Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.
    5. Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.
    6. Throughout the rainy season, each temporary containment facility shall be covered during nonworking days and prior to rain events.
    7. Materials shall be stored in their original containers and the original product labels shall be maintained in place in a legible condition. Damaged or otherwise illegible labels shall be replaced immediately.
- Bagged and boxed materials shall be stored on pallets and shall not be allowed to accumulate on the ground.
- To provide protection from wind and rain, throughout the rainy season, bagged and boxed materials shall be covered during nonworking days and prior to rain events.
- Storage areas shall be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.

Maintenance

- Check to ensure that designated storage areas are kept clean and well organized.
- Repair and/or replace perimeter controls, containment structures, and covers as needed to keep them functioning properly.

Material Use (WM-2)

Description

Material use procedures and practices are designed for use of construction material in a manner that minimizes or eliminates the discharge of these materials to storm drain systems or watercourses.

Appropriate Applications

These procedures are typically implemented at construction sites where pesticides, fertilizers, detergents, plaster, petroleum products, asphalt and concrete components, hazardous chemicals, concrete compounds and other material that may be detrimental if released to the environment are used or prepared on site.

Implementation

- Latex paint and paint cans, used brushes, rags, absorbent materials and drop cloths, when thoroughly dry and no longer hazardous, may be disposed of with other construction debris.
- Do not remove the original product label from a container, as it contains important safety and disposal information. Use all of the product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paint brushes or rinse paint containers into a street, gutter, storm drain or watercourse. Dispose of any paint, thinners, residue or sludges that cannot be recycled as hazardous waste.
- For water-based paints, paint out brushes to the extent practical and rinse to a drain leading to a sanitary sewer, where permitted or into a concrete washout pit or temporary sediment trap. For oil-based paints, paint out brushes to the extent practical and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, nontreated lumber and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials on-site when practical.
- Do not over-apply fertilizers and pesticides. Prepare only the amount needed. Follow strictly the recommended usage instructions. Apply surface dressings in smaller applications, as opposed to one large application, to allow time for them to work in and to avoid excess materials being carried off-site by runoff.
- Keep an ample supply of spill cleanup material near material use areas. Train employees in spill cleanup procedures.

Maintenance

Spot-check employees and subcontractors throughout the duration of construction job to ensure appropriate practices are being implemented.

Material and Equipment Use Over Water (NS-13)[2]

Description

Procedures for the proper use, storage, and disposal of materials and equipment on barges, boats, temporary construction pads, or similar locations that minimize or eliminate the discharge of potential pollutants to a watercourse.

Appropriate Applications

These procedures shall be implemented for construction materials and wastes (solid and liquid) and any other materials that may be detrimental if released. Applies where materials and equipment are used on barges, boats, docks, and other platforms over or adjacent to a watercourse.

Implementation

- Refer to BMPs WM-1, "Material Delivery and Storage" and WM-4, "Spill Prevention and Control."
- Use drip pans and absorbent materials for equipment and vehicles and ensure that an adequate supply of spill cleanup materials is available.
- Drip pans shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is expected to be idle for more than one hour.
- Maintain equipment in accordance with BMP NS-10, "Vehicle and Equipment Maintenance." If a leaking line cannot be repaired, remove equipment from over the water.
- Provide watertight curbs or toe boards to contain spills and prevent materials, tools, and debris from leaving the barge, platform, dock, etc.
- Secure all materials to prevent discharges to receiving waters via wind.
- Identify types of spill control measures to be employed, including the storage of such materials and equipment. Ensure that staff are trained regarding the deployment and access of control measures and that measures are being used.
- Ensure the timely and proper removal of accumulated wastes. Refer to BMPs WM-5, "Solid Waste Management" (non-hazardous) and WM-6, "Hazardous Waste Management"
- Comply with all necessary permits required for construction within or near the watercourse, such as RWQCB, U.S. Army Corps of Engineers, Department of Fish and Game and other local permitting agencies.
- Discharges to waterways shall be reported to the RE immediately upon discovery. A written discharge notification must follow within 7 days.
- Refer to BMP NS-15, "Structure Demolition/Removal Over or Adjacent to Water."

Maintenance and Inspection:

- Inspect equipment for leaks and spills on a daily basis, and make necessary repairs.

- Ensure that employees and subcontractors implement appropriate measures for storage and use of materials and equipment.
- Inspect and maintain all associated BMPs and perimeter controls to ensure continuous protection of the watercourse.

Outlet Protection/Velocity Dissipation Devices (SS-10)

Description

These devices are placed at pipe outlets to prevent scour and reduce the velocity and/or energy of exiting storm water flows.

Appropriate Applications

- These devices may be used at the outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels. Also, these devices may be used at outlets located at the bottom of mild-to-steep slopes; outlets subject to short, intense flows of water; discharge outlets that carry continuous flows of water; and points where lined conveyances discharge to unlined conveyances.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.

Implementation

- Install riprap, grouted riprap, or concrete apron at selected outlets.
- Apron length is related to outlet flow rate and tailwater level.
- For proper operation of apron:
  - Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.
  - If size of apron riprap is large, protect underlying filter fabric with a gravel blanket.
- Outlets on slopes steeper than 10 percent shall have protection.
- A conceptual outlet protection/velocity dissipation device is shown in Figure 4-10 of the *Guidelines*.

Maintenance

- Check apron for displacement of the riprap and/or damage to the underlying fabric. Repair fabric and replace the riprap that has washed away.
- Check for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.
- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

Paving Operations Procedures (NS-3)

Description

Paving operations procedures are designed to minimize pollution of storm water runoff during paving operations.

Appropriate Applications

These procedures are typically implemented where paving, surfacing, resurfacing, or sawcutting may pollute storm water runoff or discharge to storm drain systems or watercourses.

Implementation

- Substances used to coat asphalt transport trucks and asphalt spreading equipment shall not contain soap and shall be nonfoaming and nontoxic.
- Drainage inlet structures and manholes shall be covered when seal coat, tack coat, slurry seal or fog seal is applied to adjacent surfaces. Seal coat, tack coat, slurry seal, or fog seal shall not be applied if rainfall or thunderstorms are predicted to occur during the application or curing period.
- Protect drainage inlet structures and maintenance holes during paving operations, including when seal coat, tack coat, slurry seal or fog seal is applied to adjacent surfaces.
- Seal coat, tack coat, slurry seal or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.
- When using asphalt release agents (e.g., citrus, soy-based or diesel) for cleaning and coating of equipment and tools, all products and by-products shall be captured and reused, recycled, or disposed in accordance with the requirements of the Hazardous Waste Management BMP.
- Scrape residual material out of equipment using dry methods.
- Clean pavers over absorbent pads, drip pans, plastic sheeting or other materials to collect the asphalt release agents. Dispose removed material in accordance with the Hazardous Waste Management BMP.
- Pick up and reuse, recycle, or dispose of cured material in accordance with the Solid Waste Management BMP.
- Prevent water used to clean emulsion kettles from discharging into drain inlets or watercourses. Diesel oil used in kettle cleaning shall be contained and reused, recycled, or disposed of in accordance with the Hazardous Waste Management BMP.

Maintenance

- Maintain machinery regularly to minimize leaks and drips.
- Ensure that employees and subcontractors are implementing appropriate measures during paving operations.

Preservation of Existing Vegetation (SS-2)

Description

Preservation of existing vegetation is the identification and protection of desirable vegetation that provides erosion and sediment control benefits.

Appropriate Applications

- Preserve existing vegetation at areas on a site where no construction activity is planned or where it will occur at a later date.
- As described in Section 4.3.2, on a year-round basis temporary fencing shall be provided prior to the commencement of clearing and grubbing operations or other soil-disturbing activities in areas where no construction activity is planned or will occur at a later date.

Implementation

The following general steps shall be taken to preserve existing vegetation:

- Mark areas to be preserved with orange polypropylene temporary fencing.
- Minimize disturbed areas by locating temporary roadways to avoid stands of trees and shrubs and to follow existing contours to reduce cutting and filling.
- Construction materials and equipment storage and parking areas shall be located where they will not cause root compaction.
- Keep equipment away from trees to prevent trunk damage and root damage.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Disturbed vegetation outside the active area shall be replaced using the appropriate soil stabilization measures.

Maintenance

Ensure that the limits of disturbance are clearly marked. Irrigation or maintenance of existing vegetation shall conform to the requirements in the landscaping plans.

Sandbag or Gravel Bag Barrier (SC-8)—Sandbag Barrier

Description

A sandbag barrier is a temporary linear sediment barrier consisting of stacked sandbags designed to intercept and slow the flow of sediment-laden sheet flow runoff. Sandbag barriers allow sediment to settle from runoff before water leaves a construction site.

Appropriate Applications

- Sandbag barriers are typically placed below the toe of exposed and erodible slopes, downslope of exposed soil areas or around temporary soil stockpiles.
- Sandbag barriers shall be constructed with a set-back of at least 1m from the toe of a slope. Where it is determined to be not practicable due to specific site conditions, the sandbag barrier may be constructed at the toe of the slope, but shall be constructed as far from the toe of the slope as practicable.

- This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the PE.

Implementation

- Sandbag materials:
  - Bag material shall be either polypropylene, polyethylene, or polyamide woven fabric.
  - Fill material shall be noncohesive coarse sand/or gravel free from deleterious material.
- Sandbag barriers shall be implemented in conformance with the criteria presented in Section 4.3.4 of the *Guidelines*.
- A conceptual sandbag barrier is shown in Figure 4-3.

Maintenance

- Reshape or replace sandbags as needed.
- Repair washouts or other damages as needed.
- Remove sediment when accumulation reaches one-third of the barrier height. Sediments removed shall be disposed of properly.
- Remove sandbags when no longer needed. Remove sediment accumulation, clean, regrade and stabilize the area.

Sandbag or Gravel Bag Barrier (SC-8)—Gravel Bag Barrier

Description

A gravel bag berm consists of a single row of gravel bags that are installed end to end to form a barrier across a slope to intercept runoff, reduce its flow velocity, release the runoff as sheet flow and provide some removal of sediment from the runoff.

Appropriate Applications

- Gravel bag berms shall be implemented in conformance with the criteria presented in Section 4.3.4 of the *Guidelines*.
- May be used along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
  - Slope inclination between 1:20 and 1:2: BMPs shall be placed on slopes 30m and greater at intervals no greater than 15m; and
  - Slope inclination 1:2 or greater: BMPs shall be placed on slopes 15m and greater at intervals no greater than 7.5m.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.
- Although gravel bag berms provide some sediment removal, this BMP is not to be used in place of a linear sediment barrier (i.e., a silt fence, sandbag barrier, or straw bale barrier).

Implementation

- Gravel bag berm materials:
  - Bag material shall be either polypropylene, polyethylene, or polyamide woven fabric or burlap.
  - Fill material shall be one-half to one-inch of clean aggregate.
- Installation:
  - Install gravel bag berm on a level contour.
  - Tightly abut bags.

Maintenance

- Reshape or replace gravel bags as needed.
- Repair washouts or other damages as needed.
- Remove sediment when accumulation reaches one-third of the berm height. Sediments removed shall be disposed of properly.
- Remove gravel bags when no longer needed. Remove sediment accumulation. Clean, regrade and stabilize the area.

Scheduling and Planning (SS-1)

Description

This BMP involves a schedule for every project that considers sequencing of construction activities with the installation of erosion and sediment control measures. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff and vehicle tracking and to perform the construction activities and control practices in accordance with the planned schedule.

Appropriate Applications

Construction sequencing shall typically be scheduled to minimize land disturbance for all projects during the winter season.

Implementation

- Consider scheduling work items such as clearing and grubbing, grading and excavation to minimize the active construction area during the rainy season.
- Minimize soil-disturbing activities during the rainy season.
- Consider scheduling when establishing permanent vegetation (appropriate planting time for specified vegetation).

Maintenance

- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.

- When changes are warranted, amend the sequence scheduling in advance to maintain sediment control.

Sediment Trap (SC-3)

Description

A sediment trap is a temporary basin formed by excavation and/or construction of an earthen embankment across a waterway or low drainage area to detain sediment-laden runoff and allow sediment to settle out before discharging.

Appropriate Applications

Effective for the removal of large and medium sized particles (sand and gravel) and some metals that settle out with the sediment.

Implementation

- Excavation and construction of related facilities is required.
- Trap inlets shall be located to maximize the travel distance to the trap outlet.
- Use rock or vegetation to protect the trap outlets against erosion.

Maintenance

- Maintenance is required for vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Slope (Overside) Drains (SS-11)

Description

A slope drain is a pipe used to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device or stabilized area. Slope drains are typically used with lined ditches to intercept and direct surface flow away from slope areas to protect cut or fill slopes.

Appropriate Applications

- Slope drains may be used at construction sites where slopes may be eroded by surface runoff.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.
- Severe erosion may result when slope drains fail by either over-topping, piping, or pipe separation.

Implementation

- When designing slope drains:
  - Limit drainage area per pipe to 4 ha (10 ac). For larger areas, use a lined channel or a series of pipes.
  - Use interceptor dikes to direct surface runoff into the slope drain.
  - Can be placed on or buried underneath the slope surface.

- Consider the following for installing slope drains:
  - Install perpendicular to slope contours.
  - Protect area around inlet with filter cloth. Protect outlet with riprap or other energy dissipation device. For high energy discharges, reinforce riprap with concrete or use reinforced concrete device.
  - Compact soil around and under entrance, outlet and along length of pipe.
  - Securely anchor and stabilize pipe and appurtenances into soil.
  - A conceptual slope drain is shown in Figure 4-11 of the *Guidelines*.

Maintenance

- Check outlet for erosion and downstream scour. If eroded, repair damage and install additional energy dissipation measures. If downstream scour is occurring, it may be necessary to reduce flows being discharged into the channel unless other preventive measures are implemented.
- Check slope drainage for accumulations of debris and sediment.

C.1.2 Soil Binders (SS-5)

Description

Soil binders consist of applying and maintaining polymeric or lignin sulfonate soil stabilizers or emulsions.

Appropriate Applications

- Soil binders are typically applied to disturbed areas requiring short-term temporary protection. Because soil binders can often be incorporated into the work, they may be a good choice for areas where grading activities will soon resume.
- There are a wide variety of soil binders available for use, with a wide variety of application limitations. The manufacturers specifications shall be reviewed and compared to the site-specific conditions. In selecting a soil binder, the following criteria should be considered:
  - Availability of product;
  - Ease of cleanup;
  - Installed cost;
  - Degradability (how the product degrades and what its by-products are);
  - Length of drying time;
  - Erosion control effectiveness;
  - Longevity;
  - Mode of application and availability of application equipment;
  - Residual impact on future construction activities; and

- Water quality impact.

Implementation

- Prior to application, roughen embankment and fill areas. Track walking should only be used where rolling is impractical. Pre-wet the soil if called for by the manufacturer's specifications.
- Apply soil binders per manufacturer's specifications.
- Soil binders shall be nontoxic to plant and animal life and shall not stain paved or painted surfaces.
- Soil binders shall not be applied to frozen soil, areas with standing water, or when the air temperature is below 4º C (39.2°F) during the curing period.
- Consider the drying time for the selected soil binder and apply with sufficient time before anticipated rainfall. Soil binders shall not be applied during or immediately before rainfall.
- Avoid over-spray onto the traveled way, sidewalks, lined drainage channels, or and/or vegetation.

Maintenance

Check protected areas to ensure proper coverage and re-apply soil binder as needed.

Solid Waste Management (WM-5)

Description

Solid waste management procedures and practices are designed to minimize or eliminate the discharge of pollutants to drainage systems or watercourses as a result of the creation, stockpiling or removal of construction site wastes.

Appropriate Applications

Solid waste management practices are typically implemented on construction projects that generate solid wastes. These solid wastes include but are not limited to:

- Construction wastes, including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, nonhazardous equipment parts, styrofoam and other materials used to transport and package construction materials.
- Highway planting wastes, including vegetative material, plant containers and packaging materials; and
- Litter, including food containers, beverage cans, coffee cups, paper bags, plastic wrappers and smoking materials, including litter generated by the public.

Implementation

- Littering on the project site shall be prohibited.
- Trash receptacles shall be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.

- Litter from work areas within the construction limits of the project site shall be collected and placed in watertight dumpsters at least weekly.
- Full dumpsters shall be removed from the project site and the contents shall be disposed of properly.
- Storm water run-on shall be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas shall be located at least 15m from drainage facilities and watercourses and shall not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters shall be securely covered with tarps or plastic sheeting or protected in conformance with the applicable DSA protection section.
- Dumpster washout on the project site shall not be allowed.

Maintenance

- A foreman and/or construction supervisor shall monitor on-site solid waste storage and disposal procedures.
- Keep the site clean of litter and debris.

Spill Prevention and Control (WM-4)

Description

Spill prevention and control procedures and practices are typically implemented to prevent and control spills in a manner that minimizes or prevents the discharge of spilled material to drainage systems or watercourses.

Appropriate Applications

Spill prevention and control procedures are typically implemented wherever chemicals and/or hazardous substances are stored. Substances may include, but are not limited to, soil stabilizers, dust palliatives, herbicides, growth inhibitors, fertilizers, de-icing chemicals, fuels, lubricants and other petroleum distillates. To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under Title 40 of the Code of Federal Regulations (CFR) Parts 110, 117, and 302, and sanitary and septic wastes shall be contained and cleaned up immediately.

Implementation

- To the extent that this action does not compromise cleanup activities, spills shall be covered and protected from storm water run-on during rainfall.
- Spills shall not be buried or washed with water.
- Used cleanup materials, contaminated materials and recovered spill material that is no longer suitable for its intended purpose shall be stored and disposed of in conformance with these special provisions.

- Water used for cleaning and decontamination shall not be allowed to enter storm drains or watercourses.
- Water overflow or minor water spillage shall be contained and shall not be allowed to discharge into drainage facilities or water courses.
- Proper storage, cleanup and spill reporting instructions for hazardous materials stored or used on a project site shall be posted at all times in an open, conspicuous and accessible location.
- Waste storage areas shall be kept clean, well organized and equipped with ample cleanup supplies that are appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.

Maintenance

- Verify that spill control cleanup materials are located near material storage, unloading, and use areas.
- Update spill prevention and control plans and stock appropriate cleanup materials whenever changes occur in the types of chemicals stored on-site.

Stabilized Activity Entrance/Exit (TC-1)

Description

This temporary control practice is a defined point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Appropriate Applications

- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.
- Use at construction sites where dirt or mud is tracked onto public roads by construction vehicles.

Implementation

- Limit the points of entrance/exit to the construction site.
- Properly grade each entrance/exit to prevent runoff from leaving the construction site.
- Stabilize each entrance/exit with aggregate or a constructed/manufactured steel-ribbed plate.
- If aggregate is selected for stabilization, place aggregate over geotextile fabric.

Maintenance

Check for damage and repair as needed.

Stockpile Management (WM-3)

Description

Procedures and practices designed to reduce or eliminate pollution of storm water from stockpiles of soil and paving materials.

Appropriate Applications

Typically implemented anywhere soil and paving materials are stockpiled.

Implementation

- Protection of stockpiles is a year-round requirement.
- All stockpiles shall be located away from concentrated flows of storm water, drainage courses, and inlets.
- All stockpiles shall be protected from storm water run-on, using berms, dikes or other temporary diversion BMPs.
- Wind erosion control practices shall be implemented as appropriate on all stockpiled material. For specific information, see Section 4.5.8.
- Stockpiles of contaminated soil shall be managed in accordance with the Contaminated Soil Management BMP.
- Nonactive stockpiles of the identified materials shall be protected further as follows:
  - Soil stockpiles.
    - During the rainy season, soil stockpiles shall be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
    - During the non-rainy season, soil stockpiles shall be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.
    - Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate subbase:
    - During the rainy season, the stockpiles shall be covered or protected with a temporary perimeter sediment barrier at all times.
    - During the non-rainy season, the stockpiles shall be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.
    - Stockpiles of “cold mix” asphalt (pre-mixed aggregate and asphalt binder):
    - During the rainy season, these stockpiles shall be placed on and covered with plastic or comparable material at all times.
    - During the dry season, these stockpiles shall be placed on and covered with plastic or comparable material prior to the onset of precipitation.
  - Active stockpiles of the identified materials shall be protected further as follows:
    - All stockpiles shall be covered or protected with a temporary linear sediment barrier prior to the onset of precipitation.
    - Stockpiles of “cold mix” shall be covered with plastic or comparable material prior to the onset of precipitation.

Maintenance
Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.

Straw Bale Barrier (SC-9)
Description
A straw bale barrier is a temporary linear sediment barrier consisting of straw bales designed to intercept and slow the flow of sediment-laden sheet flow runoff. Straw bale barriers allow sediment to settle from runoff before water leaves a construction site.

Appropriate Applications
- Straw bale barriers are typically placed below the toe of exposed and erodible slopes, downslope of exposed soil areas or around temporary soil stockpiles.
- Straw bale barriers shall be constructed with a set-back of at least 1m from the toe of a slope. Where it is determined to be not practicable due to specific site conditions, the straw bale barrier may be constructed at the toe of the slope, but shall be constructed as far from the toe of the slope as practicable.
- This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the PE.

Implementation
- Straw bale barriers shall be implemented in conformance with the criteria presented in Section 4.3.4.
- A conceptual straw bale barrier is shown in Figure 4-4 of the *Guidelines*.

Maintenance
- Repair or replace damaged straw bales as needed.
- Repair washouts or other damage as needed.
- Remove sediment when accumulation reaches one-third of the barrier height. Sediments removed shall be disposed properly.
- Remove straw bales when no longer needed. Regrade and stabilize the area.

Straw Mulch (SS-6)
Description
Straw mulch consists of the placing of a uniform layer of straw and incorporating it into the soil with a studded roller or anchoring it with a stabilizing emulsion.

Appropriate Applications
Straw mulch is typically used for soil stabilization as a temporary surface cover on disturbed areas until soils can be prepared for revegetation and permanent vegetation is established. Straw mulch is also typically used in combination with temporary and/or permanent seeding strategies to enhance plant establishment.

Implementation

- Typical application rates are a minimum of 4,000 pounds per acre.
- Avoid use in areas where the straw mulch would be incompatible with future earthwork activities and would have to be removed.
- Straw mulch shall be derived from wheat, rice or barley.
- If stabilizing emulsion will be used to anchor the straw mulch in lieu of incorporation, roughen embankment and fill areas before placing the straw mulch by rolling with a crimping or punching-type roller or by track walking. Track walking should only be used where rolling is impractical.
- Straw mulch with emulsion shall not be applied during or immediately before rainfall.
- Avoid placing straw mulch onto the traveled way, sidewalks, lined drainage channels, or existing vegetation.

Maintenance

Maintain an unbroken, temporary mulched ground cover while DSAs are nonactive. Repair any damaged ground cover and re-mulch exposed areas.

Streambank Stabilization (SS-12)[2]

Description

Drainage systems including the stream channel, streambank, and associated riparian areas, are dynamic and sensitive ecosystems that respond to changes in land use activity. Streambank and channel disturbance resulting from construction activities can increase the stream's sediment load, which can cause channel erosion or sedimentation and have adverse affects on the biotic system. Best Management Practices can reduce the discharge of sediment and other pollutants and minimize the impact of construction activities on watercourses. Streams included on the 303(d) list by the State Water Resources Control Board (SWRCB) may require careful evaluation to prevent any increases in sedimentation, siltation and/or turbidity to the stream.

Appropriate Applications

These procedures typically apply to all construction projects that disturb or occur within stream channels and their associated riparian areas.

Limitations

Specific permit requirements or mitigation measures such as Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game may be included in contract documents. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required. Streams included on the 303(d) list by the State Water Resources Control Board because of being impaired by sediment, silt, or turbidity are required to conduct sampling to verify that there is no net increase in sediment load due to construction activities.

Maintenance and Inspection:

- Inspect BMPs daily during construction.

- Maintain and repair BMPs.
- Remove accumulated sediment as necessary.

Structure Demolition/Removal Over or Adjacent to Waters (NS-15)

Description

Procedures to protect water bodies from debris and wastes associated with structure demolition or removal over or adjacent to watercourses.

Appropriate Applications

Procedures to protect water bodies from debris and wastes associated with structure demolition or removal over or adjacent to watercourses.

Limitations

Specific permit requirements may be included in the contract documents.

Implementation

- Do not allow demolished material to enter waterway.
- Refer to BMP NS-5, “Clear Water Diversion” to direct water away from work areas.
- Use attachments on construction equipment such as backhoes to catch debris from small demolition operations.
- Use covers or platforms to collect debris.
- Platforms and covers are to be approved by the RE.
- Stockpile accumulated debris and waste generated during demolition away from watercourses and in accordance with BMP WM-3, “Stockpile Management”
- Ensure safe passage of wildlife, as necessary.
- Discharges to waterways shall be reported to the RE immediately upon discovery. A written discharge notification must follow within 7 days.
- For structures containing hazardous materials (e.g., lead paint or asbestos) refer to BMP WM-6, “Hazardous Waste Management” For demolition work involving soil excavation around lead-painted structures, refer to BMP WM-7, “Contaminated Soil Management”

Maintenance and Inspection:

- Contractor must inspect demolition areas over or near adjacent watercourses on a daily basis.
- Any debris-catching devices shall be emptied regularly. Collected debris shall be removed and stored away from the watercourse and protected from run-on and runoff.

Sweeping and Vacuuming (SC-7)

Description

The purpose of street sweeping and vacuuming is to remove tracked sediment so that the sediment does not enter a storm drain or watercourse.

Appropriate Applications

Street sweeping and vacuuming is typically implemented anywhere sediment is tracked from the project site onto public or private paved roads (typically points of egress).

Maintenance

- Substantially visible sediment tracking shall be swept or vacuumed on a daily basis.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project area.

Temporary Stream Crossing (NS-4)[2]

Description

A temporary stream crossing is a structure placed across a waterway that allows vehicles to cross the waterway during construction without entering the water, eliminating erosion and downstream sedimentation caused by the vehicles.

Appropriate Applications

Temporary stream crossings are typically installed at sites where appropriate permits have been secured (1601 Agreements, 404 Permits, and 401 Certifications), where construction equipment or vehicles need to frequently cross a waterway, when alternate access routes impose significant constraints, when crossing perennial streams or waterways causes significant erosion or where construction activities will not last longer than one year.

Implementation

- Vehicles and equipment shall not be driven, operated, fueled, cleaned, maintained, or stored in the wet or dry portions of a water body where wetland vegetation, riparian vegetation or aquatic organisms may be destroyed, except as authorized by the RE, as necessary to complete the work.
- Temporary water body crossings and encroachments shall be constructed to minimize scour. Cobbles used for temporary water body crossings or encroachments shall be clean, rounded river cobble.
- The exterior of vehicles and equipment that will encroach on water bodies within the project shall be maintained free of grease, oil, fuel, and residues.
- Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. Precautions shall be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation shall be replaced with the appropriate soil stabilization measures.
- Riparian vegetation, when removed pursuant to the provisions of the work, shall be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation shall be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble shall be removed upon completion of project activities.
- Any temporary artificial obstruction placed within flowing water shall only be built from material, such as clean gravel or sand bags, that will cause little or no siltation.

- Drip pans shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.
- Conceptual temporary stream crossings are shown in Figure 4-12 of the *Guidelines*.

Maintenance

- Check for blockage and silt buildup in the channel. Remove silt behind fords, in culverts and under bridges.
- Check for erosion of abutments, channel scour, riprap displacement or piping of soil.
- Replace aggregate from inlets and outlets of culverts.
- Remove temporary crossing promptly when it is no longer needed.

Tire Inspection and Sediment Removal (TC-3)

Description

A tire wash is an area located at stabilized construction roadway egress points to remove sediment from tires and undercarriages and to prevent sediment from being transported onto public roadways.

Appropriate Applications

- Entrance/outlet tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.
- Requires a supply of wash water.
- Requires a turnout or doublewide exit to avoid having entering vehicles drive through the wash area.

Implementation

- Incorporate with a stabilized construction roadway.
- Construct on level ground when possible, on a pad of coarse aggregate.
- Wash rack shall be designed for anticipated traffic loads.
- Provide a drainage ditch that will convey the runoff from the wash area to a sediment-trapping device.
- Ditch shall be of sufficient grade, width, and depth to carry the wash runoff.
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- A conceptual entrance/outlet tire wash is shown in Figure 4-13 of the *Guidelines*.
- Use of constructed or prefabricated steel plate with ribs for entrance/exit access (without washing) is allowed with written approval of the Resident Engineer.

Maintenance
Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.

Vehicle and Equipment Cleaning (NS-8)
Description
Vehicle and equipment cleaning procedures and practices are typically used to minimize or eliminate the discharge of pollutants from vehicle and equipment cleaning operations to storm drain systems or watercourses.

Appropriate Applications
These procedures are typically applied on all construction sites where vehicle and equipment cleaning is performed.

Implementation
- Onsite vehicle and equipment washing is discouraged.
- When using solvents for cleaning vehicles and equipment, used solvents and by-products must be captured and recycled or disposed according to the requirements of the Liquid Waste Management BMP or Hazardous Waste Management BMP, depending on waste characteristics. Minimize use of solvents.
- Truck beds used in thermoplastic striping are to be cleaned using a dry cleaning technique.
- When possible, truck beds should be cleaned using a dry cleaning technique (sweep up or shovel out).
- Vehicle washing shall occur only at designated pre-wash areas, facility wash racks or other designated areas:
  - Whether at pre-wash areas at the maintenance facility or the field, vehicle and equipment wash water shall be discharged to a sanitary sewer, or contained for percolation or evaporative drying away from storm drain inlets or watercourses. Apply sediment control BMPs if applicable.
  - Facility wash racks shall discharge to a sanitary sewer, recycle system or other approved discharge system and shall not discharge to the drainage system or watercourses.

Maintenance
Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.

Vehicle and Equipment Fueling (NS-9)
Description
Vehicle and equipment fueling procedures and practices are designed to minimize or eliminate the discharge of fuel spills and leaks into storm drain systems or watercourses.

Appropriate Applications

These procedures are typically applied on all construction sites where vehicle and equipment fueling takes place.

Implementation

- Drip pans shall be used during vehicle and equipment fueling unless the fueling is performed over an impermeable surface in a dedicated fueling area. Dedicated fueling areas shall be protected from storm water run-on and runoff and shall be located at least 15m from downstream drainage facilities or watercourses.
- Nozzles used in vehicle and equipment fueling shall be equipped with an automatic shutoff to control drips.
- Fueling operations shall not be left unattended.
- Absorbent spill cleanup materials shall be available in fueling and maintenance areas and shall be disposed properly after use.
- Vehicles and equipment leaks shall be inspected and cleaned up on each day of use. Leaks shall be repaired immediately or problem vehicles or equipment shall be removed from the project site.

Maintenance

- Keep an ample supply of spill cleanup material on-site.
- Immediately clean up spills and properly dispose of contaminated soil and cleanup material.

Vehicle and Equipment Maintenance (NS-10)

Description

Vehicle and equipment maintenance procedures and practices are designed to minimize or eliminate the discharge of pollutants to storm drain systems or watercourses from vehicle and equipment maintenance procedures.

Appropriate Applications

These procedures are typically applied on all construction projects where an on-site yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Implementation

- Drip pans shall be used during vehicle and equipment maintenance work that involves fluids unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area. Dedicated maintenance areas shall be protected from storm water run-on and runoff and shall be located at least 15m from downstream drainage facilities or watercourses.
- Drip pans shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.

- Vehicles and equipment leaks shall be inspected on each day of use. Leaks shall be repaired immediately or problem vehicles or equipment shall be removed from the project site.

Maintenance

- Maintain waste fluid containers in leak-proof condition.
- Check equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

Water Conservation Practices (NS-1)

Description

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and/or the transport of pollutants off-site.

Appropriate Applications

Water conservation practices are typically used on all construction sites where water is used.

Implementation

- Keep water equipment in good working condition.
- Repair water leaks promptly.
- Discourage washing of equipment on the construction site.
- Avoid using water to clean construction areas. Sweep paved areas where practical.
- Direct construction water runoff to areas where it can soak into the ground.

Maintenance

Repair water equipment as needed.

Wood Mulching (SS-8)[2]

Description

Wood mulching consist of applying a mixture of shredded wood mulch, bark or compost. Wood mulch is mostly applicable to landscape projects.

The primary function of wood mulching is to reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff.

Appropriate Applications

Wood mulching is considered a temporary soil stabilization (erosion control) alternative in the following situations:

- As a stand-alone temporary surface cover on disturbed areas until soils can be prepared for revegetation and permanent vegetative cover can be established.
- As short term, non-vegetative ground cover on slopes to reduce rainfall impact, decrease the velocity of sheet flow, settle out sediment and reduce wind erosion.

Limitations

- Wood mulch may introduce unwanted species.
- Shredded wood does not withstand concentrated flows and is prone to sheet erosion.
- Green material has the potential for the presence of unwanted weeds and other plant materials. Delivery system is primarily by manual labor, although pneumatic application equipment is available.

Implementation

Mulch Selection

There are many types of mulches, and selection of the appropriate type shall be based on the type of application and site conditions. Prior to use of wood mulches, there shall be concurrence with the District Landscape Architect since some mulch use on construction projects may not be compatible with planned or future projects. Selection of wood mulches by the Contractor shall comply with Standard Specifications Section 20-2.08, and must be approved by the Resident Engineer (RE).

Application Procedures

Prior to application, after existing vegetation has been removed, roughen embankment and fill areas by rolling with a punching-type roller or by track walking. The construction-application procedures for mulches vary significantly depending upon the type of mulching method specified. Two (2) methods are highlighted here:

- Green Material: This type of mulch is produced by recycling vegetation trimmings such as grass, shredded shrubs and trees. Methods of application are generally by hand, although pneumatic methods are available. Mulch shall be composted to kill weed seeds.
  - It can be used as a temporary ground cover with or without seeding.
  - The green material shall be evenly distributed on site to a depth of not more than 50 mm (2 in).
- Shredded Wood: Suitable for ground cover in ornamental or revegetated plantings.
  - Shredded wood/bark is conditionally suitable; see note under limitations.
  - Shall be distributed by hand (although pneumatic methods may be available).
  - The mulch shall be evenly distributed across the soil surface to a depth of 50 mm (2 in) to 75 mm (3 in).
- Avoid mulch placement onto the traveled way, sidewalks, lined drainage channels, sound walls, and existing vegetation.
- All material must be removed before re-starting work on the slopes.

Maintenance and Inspection

- Regardless of the mulching technique selected, the key consideration in Maintenance and Inspection is that the mulch needs to last long enough to achieve erosion-control objectives. If the mulch is applied as a stand-alone erosion control method over disturbed areas (without

seed), it shall last the length of time the site will remain barren or until final re-grading and revegetation.

- Where vegetation is not the ultimate cover, such as ornamental and landscape applications of bark or wood chips, inspection and maintenance shall focus on longevity and integrity of the mulch.

C.1.3 Maintenance Best Management Practices[3]

Check Dam (C.4.5)

Description

A check dam is a small, temporary device constructed of rock, fiber rolls, gravel bags or sandbags placed across a natural or man-made channel or drainage ditch. Restricting the flow velocity in the ditch line reduces erosion of the drainage ditch.

Appropriate Applications

- Check dams shall not be installed in watercourses without required regulatory permits.
- Check dams are primarily considered for use during emergency situations (Minor Slides and Slipouts Cleanup/Repair).
- Check dams may be used when working in areas receiving concentrated flow (see Section C.9 Clear-Water Diversion).
- Check dams may be installed in small open or steep channels.

Implementation

- Check dams should be placed at a distance and height to allow small pools to form behind them.
- A conceptual rock check dam is shown in Figure 2-5 (Page 2-74 of the *Guidelines*). The notes on the figure provide guidance for the implementation of check dams.

Maintenance

- Remove sediment prior to accumulation reaching one-third of the check dam height and consider incorporating removed sediment into the maintenance activity site.
- Remove the check dam when no longer needed.

Clear Water Diversion (C.9)

Description

Clear-water diversion consists of a system of structures and measures that intercept clear water, transport it around a maintenance activity site and discharge it downstream with minimal water quality degradation. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains and drainage and interceptor swales.

Appropriate Applications

- Clear-water diversions would most likely be implemented during Minor Slides and Slipouts Cleanup/Repair.

- It is possible that a clear-water diversion may be implemented when working on a ditch line or channel.

Implementation

- Clear-water diversions shall not be performed without required regulatory permits.
- Stationary equipment (such as motors and pumps) located within or adjacent to a water body should be positioned over drip pans.
- When any artificial obstruction is being constructed, maintained or placed in operation, sufficient water shall at all times be allowed to pass downstream to maintain aquatic life downstream.
- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations.
- Remove diversions when the maintenance activity is completed.

Compaction (C.7.1)

Description

Soil may be compacted to reduce the potential for erosion and transport of sediment to drainage systems or watercourse. When asphalt grindings are used near water bodies, the material shall be compacted.

Appropriate Applications

- Compaction is not an alternative to restoring vegetation. Compaction is restricted to areas where vegetation is undesirable or is not sustainable.
- Compaction is appropriate for unpaved shoulder areas following shoulder grading activities, guard rail post installation and sign post installation.

Implementation

- The effect of runoff from the compacted soil on nearby surface water should be considered.
- The area should be evenly graded or leveled prior to compaction.
- Compaction should not be performed while storm water runoff is observed.
- Compaction should be performed as soon as possible after grading or soil disturbance.
- Compaction may be combined with other BMPs (see Section C.7.2 Wood Mulch and Section C.7.6 Straw Mulch).

Maintenance

Compacted areas shall be inspected to identify any evidence of erosion upon the completion of maintenance activities.

Concrete Waste Management (C.13.7)

Description

Concrete waste management procedures and practices are designed to ensure that concrete wastes are properly handled and eliminate the discharge of concrete waste to storm water drainage systems or watercourses.

Appropriate Applications

Concrete waste can be generated in various maintenance activities including Curb and Sidewalk Repair, Mudjacking and Drilling, Drain and Culvert Maintenance, Drainage Ditch and Channel Maintenance, Public Facilities, Sawcutting for Loop Installation, Sign Repair and Maintenance, Median Barrier and Guard Rail Repair, and Building and Grounds Maintenance.

Implementation

- Contracts for concrete providers require contractors to appropriately manage any concrete waste and prohibit non-storm water discharges generated at the job site.
- The Department's *Standard Specifications Section 7-1.01G Water Pollution* requires compliance to applicable statutes relating to the prevention or abatement of water pollution.
- Portland cement concrete waste shall not be allowed to enter storm water drainage or watercourses.
- Concrete waste from grout pumping operations shall be contained.
- Concrete residue should be collected by vacuum or shovel for proper disposal. Concrete debris may be disposed of through on-site burial consistent with the requirements of Caltrans Standard Specification 15-3.02.
- Liquid waste can be contained in a bucket or drum with a tight-fitting lid for transport and approved off-site disposal. Plastic bags may be used if nothing else is available. Avoid breaking the bags by double-bagging and filling the bags to about one-fifth of their capacity. Allow solids to settle and recycle or dispose of in accordance with the Section C.13.2 Solid Waste Management BMP. The liquid waste may be evaporated. Decanted liquid waste shall be discharged to sanitary sewer only with the POTW's approval. Decanted liquid waste may also be removed for disposal as hazardous waste. Refer to the Hazardous Waste Management BMP (Section C.13.3).
- A temporary concrete washout facility may be constructed at the maintenance activity area. Below-grade concrete washout facilities are preferred. Above-grade facilities are used if excavation is not practical. Designated washout areas should be located at least 15 meters (50 feet) away from drainage facilities.
- Below-grade facilities consist of a pit excavated away from watercourses. Above-grade washout facilities should be bermed using sandbags or straw bales. Local requirements or other environmental restrictions should be reviewed prior to placing concrete waste on the ground.

Maintenance
The supervisor or the designee shall monitor the concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure that concrete waste is collected and disposed of properly.

Contaminated Soil Management (C.13.4)
Description
These are procedures and practices to minimize or eliminate the discharges of pollutants from contaminated soil/sediment to storm water drainage systems or watercourses.

Appropriate Applications
Contaminated soil/sediment generated during emergency response or other maintenance activities should be collected and managed for treatment or disposal.

Implementation
- Work with the local regulatory agencies to develop options for treatment, reuse and/or disposal of contaminated soil. Disposal of contaminated soil shall be in accordance with the Section C.13.2 Solid Waste Management BMP or Section C.13.3 Hazardous Waste Management BMP, depending on soil characteristics.
- Avoid stockpiling contaminated soils or hazardous material.
- Do not stockpile in or near storm water drainage systems or watercourses.
- If temporary stockpiling is necessary:
  - Cover the stockpile with plastic sheeting or tarps; and/or
  - Install a berm or barrier around the stockpile to prevent runoff from leaving the area.

Maintenance
Temporary stockpiles of contaminated soil should be inspected regularly and controls shall be repaired as needed.

Fiber Rolls (C.4.4)
Description
A fiber roll consists of commercially available straw (straw wattles), native grasses, flax or similar materials that are rolled or bound into a tight tubular roll and placed on the face of slopes at regular intervals. Fiber rolls intercept runoff, reduce flow velocity, release the runoff as sheet flow and provide some removal of sediment from the runoff. Fiber rolls are preferred at activity sites where the rolls may be left in place for assimilation into the site.

Appropriate Applications
- Fiber rolls may be used for Minor Slides and Slipouts Cleanup/Repair.
- Fiber rolls may be used along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- Fiber rolls provide some sediment control.

Implementation

- Fiber roll materials are either:
  - Prefabricated rolls; or
  - Rolled tubes of erosion control blanket.
- Assembly of field-rolled fiber roll:
  - Roll length of erosion control blanket into a tube.
  - Bind roll at each end (may be bound along length of roll with jute-type twine).
- Installation:
  - Install fiber rolls on level contours in a shallow trench.
  - Stake fiber rolls securely.
- A conceptual fiber roll installation is shown in Figure 2-4 (Page 2-72 of the *Guidelines*). The notes on the figure are useful guidance for the installation of fiber rolls.

Maintenance

- Replace or repair split, torn, unraveling or slumping fiber rolls.
- Fiber rolls should be inspected for sediment accumulation that can render the fiber roll ineffective. Normally, removed sediment may be disposed of in accordance with the Department's solid waste management practices. However, if the sediment exhibits characteristics such as odor, color and texture that are not similar to the surrounding native soil, an unknown material may be present. Notify the District HazMat Manager immediately.

Geotextiles, Mats/Plastic Covers and Erosion Control Blankets (C.7.7)

Description

This BMP involves the placement of geotextiles, mats, chainlink fencing, plastic covers or alternative erosion control products to stabilize disturbed soil areas. These measures may be temporary or permanent.

Appropriate Applications

- These measures are used where disturbed soils may be particularly difficult to stabilize, including steep slopes, slopes where erosion hazard is high and slopes where mulch must be anchored. They may be used for Slides and Slipouts Cleanup/Repair or Roadside Stabilization (see Section C.26 Vegetated Slope Inspection).
- Geotextiles, mats/plastic covers and erosion control blankets may also be used for disturbed soil areas where plants are slow to develop or where it is not the appropriate planting season.
- Geotextiles and mats/plastic covers may also be used in areas receiving concentrated flow.

Implementation

- These measures may be designed with input from geotechnical engineering or hydrology (especially if they are intended as permanent measures).

- Geotextiles, mats/plastic covers and erosion control blankets must be secured to the slope.
- Illustrations of conceptual geotextiles, mats/plastic covers and erosion control blankets are shown in Figure 2-8 of the *Guidelines.*

Maintenance

- Inspect for erosion and undermining. Ensure the controls are secured to the slope until permanent soil stabilization has been successfully attained.
- If washout or breaks occur, repair the damage to the slope or channel whenever possible and re-install the material.

Hazardous Waste Management (C.13.3)

Description

Hazardous waste management procedures and practices are designed to minimize or eliminate the discharge of pollutants at maintenance activity sites and maintenance facilities to storm water drainage systems or watercourses.

Appropriate Applications

Hazardous waste management practices are implemented during maintenance activities and at maintenance facilities that generate or store hazardous waste from the use of petroleum products, asphalt products, concrete curing compounds, pesticides, acids, paints, solvents, wood preservatives, stains, roofing tar and any other materials considered a hazardous waste.

Implementation

- At the Department's Maintenance Facilities, hazardous waste shall be stored in sealed containers constructed of a compatible material and shall be properly labeled in accordance with the Department's *Maintenance Hazardous Waste Manual*; Chapter 2 *Hazardous Waste Storage*.
- All hazardous waste shall be stored transported and disposed in accordance with federal, state and local regulations.
- Refer to the Department's *Maintenance Hazardous Waste Manual*. For example, the Hazardous Waste Manual includes the following: Chapter 2 *Hazardous Waste Storage*; Chapter 3 *Disposal of Hazardous Waste*; and Appendix E Section D5.07 *Cleanup and Transport Requirements for Government Agencies*.
- Maintenance staff are to follow label instructions regarding the proper handling, mixing and application of materials which could generate hazardous waste and a discharge to waterways.
- Maintenance staff shall implement good housekeeping procedures and exercise care and caution when handling hazardous materials capable of generating wastes that could create a contaminated water discharge. For example: Paint brushes and equipment for water- and oil-based paints shall be cleaned within a contained area and associated waste shall not be allowed to contaminate site soils, watercourses or storm water drainage systems; containers shall not be overfilled.

- The District HazMat Manager is the Maintenance Division lead for Maintenance HazMat activities. Maintenance staff shall contact the HazMat Manager immediately if wastes are generated or encountered within the Department's Right-of-Way requiring special HazMat handling procedures.

Maintenance
Periodically inspect the maintenance facility storage site to ensure all requirements are met and to review storage, disposal, and transport procedures.

Hydraulic Mulch (C.7.3)
Description
Hydraulic mulch is applied to disturbed soil areas that require protection. Hydraulic mulch consists of applying a mixture of natural or recycled fiber and a tackifier with hydro-mulching equipment. The mulch stabilizes the soil, reduces wind and water erosion and provides protection to seeds increasing survivability (see Section 2.6.3 Hydroseeding/Handseeding). It may be used as a temporary repair measure following maintenance activities (to be followed by other soil stabilization BMPs).

Appropriate Applications
- Hydraulic mulch may be applied to steeper slopes than wood mulch.
- Hydraulic mulch can be applied to areas that receive more concentrated flow where wood mulch would be washed away.
- Hydraulic mulch may be an appropriate measure for Minor Slides and Slipouts Cleanup/Repair.

Implementation
- Contact the District Landscape Specialist, District Erosion Control Specialist or Landscape Architect for the appropriate application rates. Use the recommended application rate.
- Hydro-mulching equipment is used to apply hydraulic mulch.
- Avoid mulch over-spray onto hardscaped areas.

Hydroseeding/Handseeding (C.7.4)
Description
Hydroseeding/Handseeding is a permanent soil stabilization method. Hydroseeding consists of applying a mixture of fiber, seed, fertilizer and stabilizing emulsion with hydro-mulching equipment. Other methods of seeding may also be used, including spreading by hand broadcasting or with a mechanical handspreader. Replacement planting is also covered under this BMP.

Appropriate Applications
Hydroseeding/Handseeding may be used on erodible surfaces, which require protection (e.g., Minor Slides and Slipouts Cleanup/Repair).

Implementation

- Hydroseeding can be accomplished using a multiple-step or one-step process.
- Avoid over-spray onto hardscaped areas.
- Seed should be uniformly applied.
- Seed should be scratched in or covered with straw or soil (see Section C.7.6 Straw Mulch).
- Contact the District Landscape Specialist or Landscape Architect for the appropriate seed type and application rate. The recommended seed type and application rate for the site conditions should be used.

Maintenance

Seeded or planted areas should be inspected for failures and revegetated, fertilized or mulched.

Liquid Waste Management (C.13.6)

Description

Liquid waste management procedures and practices are designed to prevent the discharge of pollutants to storm water drainage systems or watercourses as a result of the creation, collection or disposal of nonhazardous materials that may be unauthorized non-storm water discharges.

Appropriate Applications

- Liquid waste management is applicable to maintenance activities that generate nonhazardous byproducts, residuals or wastes, including drilling slurries and drilling fluids; grease-free and oil-free wastewater and rinse water; dredging; and other non-storm water liquid discharges.
- Unpermitted non-storm water discharges are prohibited.

Implementation

- Non-storm water discharges to drainage paths, drain systems and watercourses are prohibited.
- Drilling and saw cutting fluids:
  - Stick-down berms may be used to improve containment.
  - Fluids may be collected by vacuum or other methods.
  - Collected fluids shall be contained and recycled, evaporated or discharged to the sanitary sewer system with approval from the publicly-owned treatment works (POTW).
  - Fluids shall not be discharged to storm water drainage systems or watercourses.
- Vactor™• liquid wastes:
  a) A visual inspection of water drainage facilities shall be preformed prior to cleaning. Caltrans operators are trained to visually inspect for petroleum products, odors, discoloration and other physical evidence of contamination. If chemical contamination is suspected, the operators will stop work and notify the Maintenance Supervisor. The Supervisor will follow existing Caltrans Hazardous Materials Spills procedures and

coordinate removal of the contamination with the District Maintenance Hazardous Materials Coordinator.

b) Liquid waste collected in the Vactor™• trucks may be evaporated or discharged to a Regional Water Quality Control Board approved temporary decanting location in the District. The Maintenance Supervisor shall ensure Vactor™ crews are aware of approved decanting procedures and the approved decanting location.

- Tunnel cleaning:
  - Discharge to storm water drainage systems or watercourses from tunnel maintenance is prohibited.
  - Nonhazardous spent solvents shall be captured and reused, recycled or disposed in accordance with federal, state and local requirements.
  - Refer to the Section C.14 Materials Handling BMP for appropriate handling and storage of liquids at maintenance activity sites.
  - Refer to the Section C.13.7 Concrete Waste Management BMPs for appropriate management of concrete waste.

Maintenance

- At the completion of the task, remove deposited solids from containment areas and capturing devices.
- Check containment areas and capturing devices for damage and repair.

Material Delivery and Storage (C.14.1)

Description

Material delivery and storage procedures and practices are designed for the proper handling and storage of materials at the maintenance facility. These procedures and practices minimize or eliminate the discharge of these materials to storm water drainage systems or watercourses.

Appropriate Applications

- These procedures are implemented at maintenance facilities involved in the delivery and storage of aggregate, pesticides, fertilizers, detergents, plaster, petroleum products, asphalt and concrete components, hazardous chemicals, concrete compounds or other materials that may be detrimental if released to storm water drainage systems or watercourses.
- Refer to Section C.14.2 Material Use for procedures that apply to any materials that are assembled for use at a maintenance activity site.

Implementation

- Containment facilities shall provide for a spill containment volume equal to 110% of the largest container in the facility.
- Containment facilities shall be impervious to the materials stored there.
- Containment facilities should be maintained free of rainwater and spills.

- Rainwater in containment facilities should be inspected prior to discharge. Drain valves should remain closed except to release clean rainwater.
- Personnel at maintenance facilities shall be rained to ensure that materials are properly handled and stored.
- Separation should be provided between stored containers to allow for spill cleanup and emergency response cleanup.
- To provide protection from rain, bagged and boxed materials stored outdoors shall be stored on pallets throughout the rainy season.
- To provide protection from rain, bagged and boxed materials shall be covered prior to rain events.
- Storage areas shall be kept clean, well organized and equipped with cleanup supplies for the materials being stored. Perimeter controls, containment structures, covers and liners shall be repaired or replaced as needed.

Maintenance

- Check to ensure that designated storage areas are kept clean and well organized.
- Repair and/or replace perimeter controls, containment structures and covers as needed to keep them functioning properly.

Material Use (C.14.2)

Description

Material use procedures and practices are used at maintenance facilities and maintenance activity sites to prevent the discharge of materials to storm water drainage systems or watercourses.

Appropriate Applications

These procedures are implemented at maintenance facilities and at maintenance activity sites where pesticides, fertilizers, detergents, plaster, petroleum products, asphalt and concrete components, hazardous chemicals, concrete compounds and other material that may be detrimental if released to the environment are used or prepared.

Implementation

- Contract agreements with haulers who supply materials to maintenance activity sites should require them to supply materials in accordance with the requirements of this BMP.
- Latex paint and paint cans, used brushes, rags, absorbent materials and drop cloths shall be disposed of in accordance with federal, state and local requirements.
- Do not remove the original product label from a container as it contains important spill cleanup and disposal information. Make copies of the label information or material safety data sheet if needed. Use all of the product before disposing of the container. Appropriately label all secondary containers.
- Mix paint indoors or in a containment area. Do not clean paint brushes or rinse paint containers where rinsate may discharge into a street, gutter, storm water drainage systems or

watercourses. Rinsate from latex paint cleaning may be recycled or discharged to the sanitary sewer. Empty paint cans shall be dry prior to disposal as solid waste. See Section C.13.6 Liquid Waste Management and Section C.13.3 Hazardous Waste Management

- Paint should be loaded into spray equipment at a maintenance facility. Nearby drain inlets should be protected at maintenance facilities and at maintenance activity site.
- Use materials only where and when needed to complete the maintenance activity. Consider the use of safer alternative materials (See Section C.21) when possible. Reduce or eliminate use of hazardous materials on site when possible.
- Keep a supply of spill cleanup material near material use areas. Train employees in spill cleanup procedures.
- Secure loads and cover loose materials in open-bed trucks during hauling to activity sites.
- Truck beds should be inspected after the completion of material delivery to avoid depositing materials on the roadway.
- Use proper loading and unloading techniques to prevent spills.

Overside/Slope Drains (2.6.1)

Description

An overside/slope drain is a pipe used to intercept and direct surface runoff into a stabilized watercourse, a trapping device or a stabilized area. Overside/slope drains are typically used to intercept and direct surface flow away from slope areas to protect slopes. Overside/slope drains installed during maintenance efforts may be temporary. Maintenance staff may receive assistance from engineering for long-term installations or where installation is difficult.

Appropriate Applications

- Slope drains may be used at sites where slopes have been eroded by surface runoff (Minor Slides and Slipouts Cleanup/Repair).
- Severe erosion may result if overside/slope drains fail (overside/slope drains shall be inspected and maintained).

Implementation

- When installing overside/slope drains:
  - Limit drainage area per pipe. For areas larger than 4 ha (10 acre), use a lined channel or a series of pipes.
  - Use ditches, berms, dikes and swales to direct surface runoff into the overside/slope drain.
  - Secure the drain to the slope surface.
- Consider the following for installing overside/slope drains:
  - Install perpendicular to slope contours.

- Protect area around inlet. Protect outlet with riprap or other energy dissipation device. For high-energy discharges, reinforce riprap with concrete or use reinforced concrete device.
- Compact soil around and under entrance, outlet and along length of pipe.
- Securely anchor and stabilize pipe and appurtenances into soil.

Maintenance

- Regularly inspect overside/slope drains and maintain drains to ensure they are secured to the slope.
- Check outlet for erosion and downstream scour. If eroded, repair damage and install additional energy dissipation measures. If downstream scour is occurring, it may be necessary to reduce flows being discharged into the channel unless other preventive measures are implemented.
- Check slope drain for accumulation of debris and sediment. Clean drains to maintain their capacity.

Paving Operations Procedures (C.16)

Description

Paving operations procedures are designed to minimize pollution of storm water runoff during paving operations.

Appropriate Applications

These procedures are implemented where paving, surfacing, resurfacing or saw cutting may pollute storm water runoff or discharge to storm water drainage systems or watercourses.

Implementation

- Protect drainage inlet structures and manholes during paving operations including when seal coat, tack coat, slurry seal or fog seal is applied.
- Seal coat, tack coat, slurry seal or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.
- When using asphalt release agents (e.g., citrus, soy-based or diesel) for cleaning and coating of equipment and tools, all products and by-products shall be captured and reused, recycled or disposed in accordance with the requirements of the Section C.13.3 Hazardous Waste Management BMP. Asphalt release agents shall not be discharged to the storm water drainage systems or watercourses.
- Clean pavers over absorbent pads, drip pans, plastic sheeting or other materials to collect residual cleaning wastes. Dispose of removed material in accordance with the Section C.13.3 Hazardous Waste Management BMP.
- Pick up and reuse, recycle or dispose of cured material in accordance with the Section C.13.2 Solid Waste Management BMP.

- Prevent water used to clean emulsion kettles from discharging into storm water drainage systems or watercourses. Recycle products where possible to avoid discharge.
- Diesel fuel used in kettle cleaning shall be contained and reused, recycled or disposed of in accordance with the Section C.13.3 Hazardous Waste Management BMP.

Maintenance

Maintain machinery regularly to minimize leaks and drips.

Preservation of Existing Vegetation (C.8)

Description

Preservation of existing vegetation is the identification and protection of desirable vegetation that provides erosion and sediment control benefits. For activities involving the removal of vegetation, the limits of disturbance should be defined to minimize adverse effects on vegetation outside the working area.

Appropriate Applications

- Vegetation should be preserved during the following activities:
  - Shoulder Grading;
  - Drain and Culvert Maintenance;
  - Drainage Ditch and Channel Maintenance;
  - Chemical Vegetation Control;
  - Manual Vegetation Control;
  - Mechanical Vegetation Control (Mowing);
  - Tree and Shrub Pruning;
  - Tree and Shrub Removal;
  - Public Facilities;
  - Minor Slides and Slipouts Cleanup/Repair; and
  - Buildings and Grounds Maintenance.
- Preserve existing vegetation where no maintenance activity is planned or where activities will occur at a later date. Preserve existing vegetation to the maximum extent practicable.

Implementation

The following general steps should be taken to preserve existing vegetation:

- Ensure that the limits of disturbance are identified. Vegetation disturbed outside these limits should be replaced if damaged (see Section C.7.4 Hydroseeding/Handseeding).
- Minimize disturbed areas by locating temporary roadways to avoid stands of trees and shrubs. Follow existing contours to reduce cutting and filling.

- Minimize the number of access and egress points and locate them to reduce damage to existing vegetation.
- Maintenance materials and equipment storage and parking areas should be located where they will not cause root compaction.
- Keep equipment away from trees to prevent trunk damage and root damage.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Avoid placing soil around trunks of trees.

Riprap (Rock Slope Protection) (C.7.8)

Description

Riprap is placed in locations that receive concentrated flows including ditches, channels, slides and slipouts to prevent scour or reduce the energy of storm water flows.

Appropriate Applications

- Riprap may be used as a temporary measure when working in channels (Drainage Ditch and Channel Maintenance).
- Riprap can be used as a temporary or permanent measure for Slides and Slipouts Cleanup/Repair.
- Riprap may be used as a velocity dissipation measure on slopes and near pipe outlets or on the banks of channels to reduce erosion.

Implementation

- Install riprap or grouted riprap.

Maintenance

- Inspect riprap periodically and restore as necessary.
- Check for scour beneath riprap and repair damage as needed.

Safer Alternative Products (C.21)

Description

A variety of products that may be harmful to the environment if they come into contact with surface waters are used in maintenance facilities and activities. In some cases, a less harmful product that serves the same purpose can replace a harmful product. The less harmful product is referred to as a safer alternative product. The primary purpose of using safer alternative products is to reduce the potential for the discharge of toxic products to drainage paths, storm water drainage systems or watercourses.

Appropriate Applications

Safer alternative products should be considered for all maintenance activities. For example, when safer alternative products exist for cleaning products, paints, herbicides, automotive products and fertilizers, they should be used where practical and effective. Alternative products may not be available, effective or cost effective in every situation.

Implementation

- Create awareness among employees regarding the benefits of safer alternative products.
- Safer alternative product awareness will be incorporated into the Maintenance Division storm water staff training program. For example the use of lower phosphate detergents where applicable at facilities and the use of water based cleaners versus halogenated solvents (cleaning fluids).
- The materials used on Maintenance projects shall conform to approved materials in the current *State of California, Department of Transportation, Standard Specifications*. The Department's Translab has an established testing protocol for product review and testing before a material becoming a standard material for use. For example, the Standard Specifications include approved asphalt mixtures and thermoplastic striping materials.
- The use of a safer alternative product may still result in the discharge of harmful materials to drainage paths, storm water drainage systems or watercourses. All products are to be used in accordance with manufacturers' recommendations.

Sandbag or Gravel Bag Barrier (C.4.2)

Description

A sandbag or gravel bag barrier is a linear sediment barrier consisting of stacked sand- or gravel-filled bags designed to intercept and slow the flow of sediment-laden sheet flow runoff. Sandbag and gravel bag barriers allow sediment to settle from runoff before water leaves a disturbed soil area. Sandbag or gravel bag barriers may also be used to divert the flow of water (see Section C.6.2 Ditches, Berms, Dikes and Swales). Gravel bag barriers may be preferred because the gravel is easier to contain if the bag fails.

Appropriate Applications

- Sandbag and gravel bag barriers are a temporary measure used to divert water and intercept sediment. They may be used during Drain and Culvert Maintenance, Drainage Ditch and Channel Maintenance, Irrigation Line Repairs, Roadside Stabilization, Sandblasting, Wet Blast with Sand Injection and Hydroblasting, Minor Slides and Slipouts Cleanup/Repair and Building and Grounds Maintenance. Other BMPs are preferred if the barrier is required for more than a few months.
- Sandbag and gravel bag barriers should be placed below the toe of slopes with exposed and erodible soil.
- Sandbag or gravel bag barriers may be placed around stockpiles at maintenance activity sites or maintenance facilities.
- They may also be used to protect drain inlets and ditch lines during maintenance activities at maintenance activity sites or maintenance facilities.
- Due to their density, sandbags are preferable to divert flows or to prevent flows from entering a storm water conveyance system or watercourse. Gravel bags are better suited for filtration purposes.

Implementation

- Sandbag or gravel bag materials:
  - Bag material should be canvas, polypropylene, polyethylene, burlap or polyamide woven fabric.
  - Fill material should consist of clean coarse sand or gravel.
- A conceptual sandbag barrier is shown in Figure 2-2 Page 2-67 of the ***Guidelines***. Notes on the figure provide guidance for implementation.

Maintenance

- Inspect sandbags and gravel bags to ensure the sediment barrier is functioning properly.
- Reshape or replace sandbags and gravel bags as needed.
- Repair washouts or other damage as needed.
- Consideration should be given to incorporating removed sediment into the maintenance activity site.
- Remove sandbags and gravel bags when no longer needed. Remove sediment accumulation, clean the maintenance activity site of debris, regrade if necessary and stabilize the area.

Scheduling and Planning (C.3)

Description

This BMP involves scheduling and planning of all activities (at maintenance facilities or maintenance activity sites) in a manner that considers the use of BMPs. Planning is needed to reduce the exposure of potential pollutants to wind, rain, runoff and vehicle tracking. Planning is important when working in the vicinity of a drainage system or water body. Caltrans Regional Work Plans identify sensitive water bodies where even higher levels of protection are needed. This BMP also includes the scheduling of maintenance activities and control practices to minimize potential water quality impacts during rainfall events.

Appropriate Applications

Except for emergency conditions, the following activities shall not be performed during rain events or when storms are predicted:

- Asphalt cement crack and joint grinding/sealing;
- Asphalt paving;
- Structural pavement failure (digouts);
- Pavement grinding and paving;
- Sealing operations;
- Concrete slab repair (concrete spall repair is allowed);
- Portland cement crack and joint sealing;
- Mudjacking and drilling;

- Shoulder grading (should not be performed if runoff is visible);
- Nonlandscaped chemical vegetation control;
- Curb and sidewalk repair;
- Chemical vegetation control;
- Painting;
- Thermoplastic striping and marking;
- Paint striping and marking;
- Raised/recessed pavement marker application and removal; and
- Outdoor vehicle and equipment maintenance.

Maintenance activities should be scheduled to minimize land disturbance during the rainy season.

Implementation

- During the rainy season and prior to forecast storm events, avoid scheduling maintenance activities that could adversely affect storm water quality.
- Establish the appropriate planting time when introducing vegetation. If it is necessary to vegetate disturbed soil at other times of the year, then perform more frequent inspections and maintenance. Apply other BMPs (e.g., Section 2.7.2 Wood Mulch or Section 2.7.6 Straw Mulch) if the vegetation is not successfully established.

Maintenance

- Verify that work is progressing in accordance with the schedule. If the schedule changes, revise BMPs as necessary.
- Inspect vegetation and perform maintenance to ensure it is established.

Sediment Trap (C.4.6)

Description

A sediment trap is a basin formed by excavating or constructing an earthen embankment across a ditch line or low drainage area (see Figure 2-6 (Page 2-74 of the of the *Guidelines*)). A sediment trap is appropriate for long-term application at a maintenance activity site.

Appropriate Applications

- Sediment traps may be used where the contributing drainage area is less than 2 ha (5 acres). Traps should be placed where sediment-laden storm water may enter a storm water drainage system or watercourse.
- Sediment traps may be used for Minor Slides and Slipouts Cleanup/Repair.
- Sediment traps shall not to be located in waterways.

Implementation

- Traps should be situated according to the following criteria: (1) by excavating a suitable area, such as a low embankment constructed across a swale; (2) where failure would not cause loss of life or property damage; and (3) to provide access for maintenance, including sediment removal and temporary storage of sediment in a protected area.
- Sediment traps should be adequately sized to allow settling of sediment.
- Trap inlets should be located to maximize the travel distance to the trap outlet. Rock or vegetation may be used to protect the trap outlets against erosion (see Section C.7.8 Riprap).
- To dewater the trap, the outlet may be constructed in one of the following two ways: (1) use a small diameter riser pipe with dewatering holes encased in gravel; or (2) construct a crushed stone outlet section of the embankment at the low point of the trap.

Maintenance

- Check sediment trap for seepage and structural soundness.
- Check outlet structure and spillway for any damage or obstructions. Repair damages and remove obstructions as needed.
- Check outlet area for erosion and stabilize if required.
- Remove sediment prior to accumulating one-third the volume of the trap.
- Properly dispose of sediment and debris removed from the trap as follows:
  - Dispose of debris in accordance with Section C.13.2 Solid Waste Management
  - Incorporate sediment into the maintenance activity site or manage in accordance with Section C.13.2 Solid Waste Management

Soil Binders (C.7.5)

Description

Soil binders consist of applying and maintaining polymeric or lignin sulfonate soil stabilizers or emulsions.

Appropriate Applications

Soil binders may be applied to disturbed soil areas or soil stockpiles requiring short-term protection.

A variety of soil binders are available for use. Prior to use, the manufacturers' specifications should be reviewed and compared to the site-specific conditions. In selecting a soil binder, the following criteria should be considered:

- Availability of product;
- Ease of cleanup;
- Degradability (how the product degrades and what its by-products are);
- Length of drying time;

- Erosion control effectiveness;
- Longevity;
- Mode of application and availability of application equipment; and
- Water quality impact.

Implementation

- Apply soil binders per manufacturer's specifications.
- Soil binders shall be nontoxic to plant and animal life.
- Soil binders shall not be applied to frozen soil or areas with standing water.
- Soil binders should not be applied during or immediately before rainfall.
- Avoid over-spray onto hardscaped areas.

Maintenance

Check protected areas to ensure proper coverage and re-apply soil binder as needed, or implement additional BMPs.

Solid Waste Management (C.13.2)

Description

Solid waste management procedures and practices are designed to minimize or eliminate the discharge of pollutants to drainage systems or watercourses associated with the stockpiling or removal of maintenance activity wastes.

Appropriate Applications

Solid waste management practices are implemented during maintenance activities that generate solid wastes. These solid wastes include, but are not limited to:

- Maintenance wastes, including brick, mortar, asphalt concrete, Portland cement, concrete, timber, steel and metal scraps, pipe and electrical cuttings, nonhazardous equipment parts, styrofoam, grindings, sandblast grit and other materials used to transport and package maintenance materials;
- Highway planting wastes, including vegetative material, plant containers and packaging materials; and
- Litter and debris, including food containers, beverage cans, coffee cups, paper bags and plastic wrappers.

Implementation

- Use dry cleanup techniques (e.g., vacuuming, sweeping, dry rags) to remove solid waste from the maintenance activity site when practicable. Use another technique only when dry cleanup techniques are not practicable, such as having to wet for dust control for safety or air quality reasons.
- Recycle, reuse or properly dispose of solid waste.

- Storm water run-on shall be prevented from contacting stored solid waste through the use of ditches, berms, dikes and swales (see Section C.6 Concentrated Flow Conveyance Controls BMPs).
- Solid waste storage areas at maintenance facilities should be located away from drainage facilities and watercourses and shall not be located in areas prone to flooding or ponding.
- Reuse of asphalt grindings shall be in accordance with the California Department of Fish and Game MOU.
- Reused asphalt grindings shall be compacted when the material is placed near water bodies. (see Section C.7.1 Compaction)

Maintenance

- Periodically inspect the solid waste storage areas and review the disposal procedures.
- Repair or replace damaged or missing BMPs.

Spill Prevention and Control (C.13.1)

Description

Spill prevention and control procedures and practices are implemented to prevent and control spills in a manner that minimizes or prevents discharge to storm water drainage systems or watercourses at maintenance activity sites and maintenance facilities (see Section C.14.2 Material Use for additional materials handling procedures).

Appropriate Applications

- These controls apply at maintenance activity sites and at maintenance facilities.
- Spill prevention and control procedures are implemented wherever non-hazardous chemicals and/or hazardous substances are stored or used. Substances may include, but are not limited to, soil stabilizers, dust palliatives, pesticides, growth inhibitors, fertilizers, paints, de-icing chemicals, fuels, lubricants and other petroleum distillates.
- To the extent that the clean up work can be accomplished safely, wastes shall be contained and cleaned up immediately.

Implementation

- If a spill or leak occurs in the containment area, accumulated rainwater shall be evaluated to determine appropriate disposal method.
  - If accumulated rainwater is hazardous, dispose of in accordance with the Section C.13.3 Hazardous Waste Management BMP.
  - If accumulated rainwater is chemically contaminated, but non-hazardous, dispose of in accordance with the Section C.13.6 Liquid Waste Management BMP.
- To the extent that cleanup activities and safety are not compromised, spills shall be covered and protected from storm water run-on during rainfall.
- Dry cleanup methods should be used when possible.

- Used cleanup materials, contaminated materials and recovered spill material that is no longer suitable for its intended purpose shall be disposed in accordance with the Section C.13.3 Hazardous Waste Management BMP or Section C.13.2 Solid Waste Management BMP, depending on waste characteristics.
- Contaminated water used for cleaning and decontamination shall not be allowed to enter storm water drainage systems or watercourses.
- Waste storage areas shall be kept clean, well organized and equipped with cleanup supplies that are appropriate for the materials being stored. Perimeter controls, containment structures, covers and liners shall be repaired or replaced as needed to maintain proper function.
- Tarps and similar control measures should be used to prevent spills or material drift from being deposited into watercourses (e.g., during bridge maintenance).

Maintenance

- The spill response plan shall be available for maintenance staff in the facility supervisor's office or in a designated area for facility reference documents.
- Verify that spill control cleanup materials are located near material storage, unloading and use areas.
- Update spill prevention and control plans and stock appropriate cleanup materials whenever changes occur in the types of chemicals stored on site.

Stabilized Activity Entrance/Exit (C.12.1)

Description

This temporary control practice is a defined point of entrance/exit to a maintenance site that is stabilized to reduce the tracking of mud and soil onto public roads by maintenance vehicles.

Appropriate Applications

- Use at maintenance activity sites where sediment may be tracked onto public roads by maintenance vehicles.

Implementation

- Limit the points of entrance/exit to the maintenance activity site.
- Stabilize entrance/exits with wood chips, straw, rock aggregate, commercially available manufactured steel-ribbed plate or other suitable material.

Maintenance

- Inspect entrance/exit for functionality.
- Replace or supplement rock aggregate as needed.
- Periodically clean steel-ribbed plates.
- Incorporate removed sediment or soil back into the maintenance activity site.

Stockpile Management (C.17)

Description

Stockpile management procedures and practices are designed to reduce or eliminate pollution of storm water from stockpiles of vegetative wastes and paving materials.

Appropriate Applications

- Stockpile management procedures are used for stockpiles of contaminated and uncontaminated soil.
- Stockpile management procedures are used for the stockpiling of vegetative waste and paving materials.
- Stockpile management procedures are used for materials removed from drains, ditches and culverts.
- Stockpile management procedures are used for waste piles.
- Stockpile management procedures are used for any other material or waste that could impact storm water quality.

Implementation

- Do not locate stockpiles in areas of concentrated flows of storm water, drainage systems, inlets or watercourses.
- Do not locate stockpiles adjacent to sensitive water bodies.
- Divert storm water run-on away from stockpiles. See Section C.6.2, Ditches, Berms, Dikes and Swales.
- Wind erosion control practices shall be implemented on stockpile material. See Section C.11, Wind Erosion Control BMP.
- Manage stockpiles of contaminated soil in accordance with the Section C.13.4, Contaminated Soil Management BMP.
- Minor slides/slipouts usually occur during major storms. Stockpiles should be removed as soon as practicable and materials should be placed so that waterways are not impacted (see Section C.4 Sediment Control).
- During rain events, stockpiles of "cold mix" asphalt (i.e., pre-mixed aggregate and asphalt binder) shall be covered. Any deviation from this BMP for "cold mix" shall be coordinated with the RWQCB.
- During rain events, soil stockpiles shall be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier.
- During rain events, stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base or aggregate subbase shall be covered or protected with a temporary perimeter sediment barrier.

Maintenance
Repair and/or replace perimeter controls and covers as necessary to keep them functioning properly.

Storm Water Dewatering Operations (temporary pumping operations) (C.28)
Description
These practices are implemented where storm water is pumped. This BMP addresses discharge from portable pumps used by maintenance personnel during repairs and to prevent damage to the highway.

Appropriate Applications
These practices are implemented where storm water is pumped as part of a maintenance activity. Note that per Section 5 of the Statewide SWMP, some discharges are exempt or conditionally exempt.

Implementation
- Ensure that dewatering discharges do not cause erosion at the discharge point.
- Pumping systems should be equipped with screens on the intake.
- Intakes should be located to reduce the pumping of sediment. Pumping areas near the storm water surface often contain less sediment than areas near the bottom.
- Sediment Control BMPs may be installed at intake or outlet locations to trap excessive sediment.

Straw Bale Barrier (C.4.3)
Description
A straw bale barrier is a linear sediment barrier consisting of straw bales designed to intercept and slow the flow of and filter sediment-laden sheet flow runoff. Straw bale barriers allow sediment to settle from runoff before water leaves a disturbed soil area. Straw bale barriers are readily available and suitable for many short-term applications in maintenance activities. Straw bale barriers have the disadvantages of being bulky and heavy when wet.

Appropriate Applications
- Straw bale barriers are best suited for short-term applications and should not be placed into areas receiving concentrated flow.
- Straw bale barriers are typically placed below the toe of exposed and erodible slopes, downslope of disturbed soil areas (e.g., Minor Slides and Slipouts Cleanup/Repair).
- Straw bale barriers may be placed around stockpiles at maintenance activity sites or at maintenance facilities.
- Straw bale barriers may also be used to protect drain inlets and ditch lines at maintenance activity sites or maintenance facilities during maintenance activities.

Implementation

A conceptual straw bale barrier is shown in Figure 2-3 (Page 2-70 of the *Guidelines*). The notes on the figure are useful guidance for the placement and anchoring of larger barriers.

Maintenance

- Repair or replace damaged straw bales as needed.
- Repair washouts or other damage as needed.
- Consideration should be given to incorporating removed sediment into the maintenance activity site.
- Remove straw bales when no longer needed. Remove or redistribute accumulated sediment to grade and stabilize the area.

Straw Mulch (C.7.6)

Description

The application of straw mulch consists of placing of a uniform layer of straw. It may be attached by wetting, with an organic tackifier or by mechanical means. It is effective for short-term applications and may be combined with other BMPs (e.g., Section 2.7.4 Hydroseeding/Handseeding).

Appropriate Applications

- Straw mulch may be an appropriate temporary measure for responding to Minor Slides and Slipouts Cleanup/Repair.
- Straw mulch may be applied as a short-term measure to disturbed soil areas. It can be used in this manner for Building and Grounds Maintenance.
- Straw mulch may be used for Roadside Stabilization (see Section 2.26 Vegetated Slope Inspection).
- Straw mulch may also be used in combination with permanent seeding strategies (Section 2.7.4 Hydroseeding/Handseeding) to enhance plant establishment.
- Straw mulch can be applied to steeper slopes than wood mulch.

Implementation

- Straw mulch should be derived from native grass, oat, wheat, rice or barley.
- Straw mulch with organic tackifier should not be applied during or immediately before rainfall.
- Avoid placing straw mulch onto hardscaped areas.

Maintenance

Straw mulch should be periodically inspected and maintained until permanent stabilization measures or repairs are successful.

Sweeping and Vacuuming (C.29)

Description

Sweeping and vacuuming are performed to remove litter, debris and de-icing abrasives from paved roads and shoulders. Sweeping to reduce track-out generally involves manual sweeping or use of small equipment, but does not exclude the use of sweepers should the need arise (e.g., for slides and slipouts).

Appropriate Applications

- Sweeping and vacuuming operations are appropriate for removing de-icing abrasives, material from small slides, litter and debris.
- Sweeping and vacuuming may be implemented anywhere sediment is tracked from off-road maintenance activity sites onto public or private paved roads typically at the points of egress.

Implementation

Highway Sweeping:

- Do not sweep up any unknown substance that may be potentially hazardous. If a substance is known to be hazardous, suspected of being hazardous or cannot be identified, notify the District Maintenance HazMat Manager immediately. If an illegally dumped substance within the Department's Right of Way has the potential of entering a municipal drain system, the immediate supervisor and the District Storm Water Coordinator must be notified so that the downstream municipality can be contacted.
- Adjust brooms to maximize the efficiency of sweeping operations.
- Do not load hoppers beyond their capacity.
- Dispose of waste to a landfill or approved site in accordance with local regulations and Section C.13.2, Solid Waste Management BMP. There is to be no dumping on site, especially during the rainy season or during unseasonal storm events to abate wash out. Clean materials may be incorporated into the maintenance activity area. Tracking Control:
- Substantially visible sediment shall be swept or vacuumed from the maintenance activity site.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the maintenance activity site.
- Washing and rinsing of equipment shall be performed in designated areas and the resulting runoff shall not be discharged to the storm drain system.

Description

This BMP involves scheduling and planning of all activities (at maintenance facilities or maintenance activity sites) in a manner that considers the use of BMPs. Planning is needed to reduce the exposure of potential pollutants to wind, rain, runoff and vehicle tracking. Planning is important when working in the vicinity of a drainage system or water body. Caltrans Regional Work Plans identify sensitive water bodies where even higher levels of protection are needed. This BMP also includes the scheduling of maintenance activities and control practices to minimize potential water quality impacts during rainfall events.

Appropriate Applications

Except for emergency conditions, the following activities shall not be performed during rain events or when storms are predicted:

- Asphalt cement crack and joint grinding/sealing;
- Asphalt paving;
- Structural pavement failure (digouts);
- Pavement grinding and paving;
- Sealing operations;
- Concrete slab repair (concrete spall repair is allowed);
- Portland cement crack and joint sealing;
- Mudjacking and drilling;
- Shoulder grading (should not be performed if runoff is visible);
- Nonlandscaped chemical vegetation control;
- Curb and sidewalk repair;
- Chemical vegetation control;
- Painting;
- Thermoplastic striping and marking;
- Paint striping and marking;
- Raised/recessed pavement marker application and removal; and
- Outdoor vehicle and equipment maintenance.

Maintenance activities should be scheduled to minimize land disturbance during the rainy season.

Implementation

- During the rainy season and prior to forecast storm events, avoid scheduling maintenance activities that could adversely affect storm water quality.
- Establish the appropriate planting time when introducing vegetation. If it is necessary to vegetate disturbed soil at other times of the year, then perform more frequent inspections and maintenance. Apply other BMPs (e.g., Section C.7.2 Wood Mulch or Section C.7.6 Straw Mulch) if the vegetation is not successfully established.

Maintenance

- Verify that work is progressing in accordance with the schedule. If the schedule changes, revise BMPs as necessary.

- Inspect vegetation and perform maintenance to ensure it is established.

Tire Inspection and Sediment Removal (C.12.2)

Description

Tires are inspected and sediment is removed to reduce tracking of sediment onto public roads or the highway.

Appropriate Actions:

- Tires should be inspected after the completion of off-road activities. Sediment should be removed as needed.

Implementation

- Inspect tires prior to entering the roadway after off-road work.
- Use dry cleanup techniques to remove rock and sediment from tires prior to leaving the worksite.

Vegetation Slope Inspection (C.26)

Description

Districts have established Maintenance Inspection/Slope Stabilization Teams to review vegetated slopes. The program will identify problematic slopes for repair to reduce erosion.

Appropriate Application:

Slope and unpaved areas should be inspected on a five-year cycle.

Implementation

The following general steps should be taken to evaluate slopes and re-establish vegetation:

- Minor slides and slipouts requiring a Maintenance Division response shall be inspected and evaluated at the time of response field activities.
- Areas should be inspected for erosion on a five-year cycle.
- Areas with recurring problems should be inspected on an as-needed basis.
- Slope repairs that are within the abilities of the Maintenance Inspection/Slope Stabilization Team should be repaired by that team.
- Each District will establish a multi-disciplinary team to review problem slopes.
- Problem slopes with erosion concerns that cannot be repaired by the Maintenance Inspection/Slope Stabilization Team should be reported to the multi-disciplinary team. These projects should be forwarded to the State Highway Operation and Protection Program for possible funding and repair.
- A standard Maintenance Division reporting format for scheduling, inspection findings and repairs has been developed for the program.

- *The Preliminary Maintenance Slope Inspection Form* (number CT-MAINT-NPDE-S005) is to be used and is available electronically from the Department's Headquarters Maintenance Division.

Vehicle and Equipment Cleaning (C.15.1)

Description

Discharges to storm water drainage systems or watercourses from vehicle and equipment cleaning are prohibited. Vehicle and equipment cleaning procedures and practices are used to eliminate the discharge of pollutants from vehicle and equipment cleaning operations to storm water drainage systems or watercourses.

Appropriate Applications

- These procedures apply whenever vehicle and equipment cleaning is performed.
- Waste generated during concrete washout must be managed in accordance with the Section C.13.7 Concrete Waste Management BMP. Non-storm water discharges of concrete washout are prohibited.

Implementation

- Contractual provisions require contractors to use cleaning practices consistent with the requirements of this BMP when working at maintenance activity sites.
- When using solvents for cleaning vehicles and equipment, used solvents and by-products shall be captured and reused, recycled or disposed of according to the requirements of the Section C.13.6 Liquid Waste Management BMP or Section C.13.3 Hazardous Waste Management BMP, depending on waste characteristics. Minimize use of solvents.
- When possible, truck beds should be cleaned using a dry cleanup technique (sweep up or shovel out).
- Vehicle and equipment washing shall occur only at designated pre-wash areas, facility wash racks or other designated areas:
  - Whether at pre-wash areas at the maintenance facility or the field, vehicle and equipment wash water shall be discharged to a sanitary sewer. If no connection to the sanitary sewer available, wash water should be contained for percolation (if preapproved by the RWQCB) or evaporative drying away from storm drain inlets or watercourses.
  - Facility wash racks shall discharge to a sanitary sewer, recycle system or other approved discharge system and shall not discharge to the storm water drainage systems or watercourses.
  - Concrete washout areas are described under Section C.13.7 Concrete Waste

Management

- Minimize water use to reduce potential for unpermitted non-storm water discharges (e.g., provide a positive shutoff type of hose nozzle).
- Post signs for pre-wash and wash areas that identify the allowable cleaning methods for the location and discharge prohibitions.

Maintenance

- Regularly inspect and maintain the designated pre-wash areas, facility wash racks, designated cleaning areas, wash pads, clarifiers, oil-water separators, sumps and sediment traps.

Vehicle and Equipment Fueling (C.15.2)

Description

Vehicle and equipment fueling procedures and practices are designed to minimize or eliminate the discharge of fuel spills and leaks into storm water drainage systems or watercourses during equipment fueling and the bulk delivery of fuel.

Appropriate Applications

These procedures apply at all maintenance sites where vehicle and equipment fueling occurs.

Implementation

Bulk Fuel Delivery

- All aboveground and underground storage tanks shall be equipped with automatic overfill shutoff valves.
- Implement Section C.13.1 Spill Prevention and Control BMP to prevent spillage.

Fueling Area Maintenance

- Label drains at fuel dispensing areas to indicate if they discharge to the storm drain or to the sewer.
- Storm drain inlets may be temporarily covered with spill pads and/or mats during fueling operations.
- Absorbent spill cleanup materials or drip pans shall be stored in fueling and maintenance areas and used materials shall be disposed in accordance with the Section C.13.3 Hazardous Waste Management BMP.
- Immediately clean up leaks and drips.
- Hosing off the fueling area is prohibited. Dry shop clean up practices should be used.
- Manage wastes to reduce adverse impacts on storm water quality (see Section C.13.2 Solid Waste Management and Section C.13.3 Hazardous Waste Management). Fueling areas should be kept free of litter and debris that might become contaminated with petroleum products.
- Maintain and implement a current spill response plan for fueling operations.

Refueling Practices

- Nozzles used at dedicated fueling areas shall be equipped with an automatic shutoff.
- Warnings against "topping off" fuel tanks should be posted at fuel dispensers.
- Fueling operations shall not be left unattended.

- Fueling in the field shall not be performed near unprotected drainage facilities or watercourses. See Section C.13.1 Spill Prevention and Control BMP for pollution prevention and response requirements.

Maintenance

- Inspect fueling facilities daily and correct deficiencies.
- Keep a supply of spill cleanup materials on site.

Vehicle and Equipment Maintenance (C.15.3)

Description

Vehicle and equipment maintenance procedures and practices are designed to minimize or eliminate the discharge of pollutants to storm water drainage systems or watercourses from vehicle and equipment maintenance.

Appropriate Applications

- These procedures are applied where equipment and vehicles are stored or repaired.
- These procedures should be implemented to avoid prohibited discharges to the storm water drainage system of fuel, oil, hydraulic fluid, brake fluid, antifreeze and wiper fluid.

Implementation

Indoor Maintenance

- Maintenance should be performed in covered or indoor maintenance areas where potential pollutants cannot be introduced into storm water drainage systems.

Field or Outdoor Maintenance

- Drip pans or absorbent materials shall be used during vehicle and equipment maintenance work that involves fluids.
- See Section C.13.1 Spill Prevention and Control BMP for pollution prevention and response measures.
- The Section C.13.4 Contaminated Soil Management BMP should be used to address any contaminated soil resulting from vehicle or equipment repair.
- Use dry methods (e.g., dry rags, vacuuming or sweeping) for cleaning associated with maintenance in outdoor areas.

General Maintenance (in the field or in the yard)

- Vehicles and equipment shall be inspected for leaks on each day of use. Leaks should be repaired immediately; problematic vehicles or equipment shall be removed from the maintenance activity site.
- All parts washing should be performed in designated areas. Do not wash parts where wash waste cannot be captured. Use self-contained sinks or tanks when working with solvents.
- Non-storm water discharges into storm water drainage systems or watercourses are prohibited.

- Wastes should be collected and reused, recycled, removed or disposed of in accordance with the Section C.13.3 Hazardous Waste Management BMP.

Maintenance

- Inspect areas following field maintenance areas to ensure there is no residual contamination that might impact storm water quality. Clean areas as needed using dry methods, (e.g., sweeping or vacuuming).
- Maintain waste fluid containers in leak-proof condition.
- Inspect equipment for damaged hoses and leaky gaskets. Repair or replace as necessary.

Water Conservation Practices (C.18)

Description

Water conservation practices minimize water use during a maintenance activity to avoid causing erosion and/or the transport of pollutants into the drainage system and watercourses. Non-storm water discharges to storm water drainage systems and watercourses are prohibited unless the discharge is authorized by a separate National Pollutant Discharge Elimination System (NPDES) permit, exempted or conditionally exempt as provided in the Caltrans Statewide Storm Water Permit.

Appropriate Applications

- All maintenance activities should practice water conservation.
- Unpermitted non-storm water discharges are prohibited.

Implementation

- Keep water application equipment in good working condition.
- Avoid using water to clean maintenance areas. Use dry cleanup methods where practical. Sweep paved areas.
- Use the minimum amount of water needed to complete each maintenance activity.

Maintenance

- Repair water supply and distribution equipment to minimize the loss of water.

Wood Mulching (C.7.2)

Description

Wood mulch consists of applying chipped material or commercially available wood mulch products to reduce the potential for eroding the underlying soil. Wood mulch is readily available and has an attractive appearance. Wood mulch may be chosen over other stabilization measures to reduce germination of noxious weeds and the need for vegetation control measures.

Appropriate Applications

- Wood mulch is appropriate for landscaping applications (Building and Grounds Maintenance).

- Wood mulch may be considered as an option for the Roadside Stabilization Activity (see Section 2.26 Vegetated Slope Inspection).
- Wood mulch may also be considered as an option during Irrigation Line Repairs.
- Wood mulch should not be applied to steep slopes or placed into drainage paths that could receive concentrated flow. Wood mulch is prone to displacement under these conditions.

Implementation

- Contact the District Landscape Specialist, District Erosion Control Specialist or Landscape Architect for the appropriate application rates. Use the recommended application rate.
- Wood mulch may be applied by hand, with blowers or with chippers.
- Avoid application onto hardscaped areas.

Maintenance

Periodically inspect areas where mulch has been applied.

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[1] The descriptions of construction site BMPs contained in this section were adapted from Caltrans' Storm Water Quality Practice Guidelines, unless otherwise noted.

[2] This BMP description was not adapted from Caltrans' Stormwater Quality Practice Guidelines; rather, it was adapted from its Construction Site Best Management Practices Manual.

[3] The descriptions of maintenance BMPs contained in this section were adapted from Caltrans' Storm Water Quality Practice Guidelines.

C.2 Additional Best Management Practices

ABMP-1.1: When practicable, operate equipment during the least sensitive diurnal, seasonal, and meteorological periods relative to the potential effects on listed species and habitat

ABMP-2.1: When practicable, avoid maintenance and construction activities at night

ABMP-2.2: When night work cannot be avoided, avoid and minimize disturbance of listed species by restricting substantial use of temporary lighting to the least sensitive seasonal and meteorological windows (Table 1-5)

ABMP-2.3: Shield and focus lights on work areas to minimize lighting of listed species habitat

ABMP-6.1: Install falsework to keep bridge debris and construction and maintenance materials from falling into streams during demolition, construction, and substantial maintenance activities

ABMP-7.1: Water pumped from construction isolated from surface water shall be discharged to an upland area providing overland flow and infiltration before returning to stream. Upland areas may include sediment basins of sufficient size to allow infiltration rather than overflow or adjacent dry gravel/sand bars if the water is clean and no visible plume of sediment is created downstream of the discharge.

ABMP-8.1: If feasible, drill outside of the stream channel or work only in dry stream beds

ABMP-8.2: When geotechnical drilling takes place within the stream channel, including gravel beds and bars, drilling mud shall be bentonite without additives; initial drilling through gravel will be accomplished using clean water as a lubricant; after contact with bedrock or consolidated material, drilling mud (i.e., bentonite clay) may be used

ABMP-8.3: All drilling fluids and materials will be self-contained and removed from the site after use; conduct drilling inside a casing so that all spoils are recoverable in a collection structure

> Water, fluids, and spoils generated by drilling or incidentally found within barges, boats, and drilling equipment will be captured and retained within drums and transported to approved disposal sites; bilge water will not be discharged to the river, bay, or wetlands

ABMP-8.4: If drilling must occur in water, isolate the work area or divert flow around the work area

> Where practicable, drilling from a barge rather that from fill material placed within the river or on the natural channel bottom

ABMP-8.5: Water, fluids, and spoils generated by drilling or incidentally found within barges, boats, and drilling equipment will be captured and retained within drums and transported to approved disposal sites; bilge water will not be discharged to the river, bay, or wetlands

ABMP-10.1: Preserve trees as identified in any special contract provisions or as directed by the Project Engineer

ABMP-10.2: Remove hazard trees greater than 24-inches dbh only by direction of the Project Engineer

ABMP-10.3: Fell trees in such a manner as not to injure standing trees and other plants

ABMP-10.4: Environmentally Sensitive Areas shall be fenced to prevent encroachment of equipment and personnel into wetlands, riparian areas, stream channels and banks, and other sensitive habitats to the maximum extent practicable

- Sensitive habitat elements include LWD, SRA cover, salmonid spawning gravel, and natural pools
- Riparian areas outside of the designated work areas will be designated as Environmentally Sensitive areas
- Fence or mark sensitive areas with high-visibility fencing or signs prior to construction activities to prevent encroachment of equipment and personnel
- To the extent practicable, instream work that disturbs the stream channel within 300 feet upstream of spawning gravel should be completely isolated from the active stream using inflatable bags, sandbags, sheet piles, or gravel berms

Environmentally Sensitive areas will be clearly indicated on project construction plans.

Spawning Gravel Survey Methods

Identify suitable spawning gravel patches to be measured. Suitable spawning gravel patches:

- have a minimum area of 10 square feet and are at least 6 inches deep (depth refers to thickness of gravel layer),
- are not armored with cobbles or rocks greater than 6 inches in any dimension, and
- contain gravel sizes ranging primarily from 0.25 to 4.0 inches in diameter.

ABMP-10.5: Mow vegetation to a height greater than 4 inches (102 millimeters)

ABMP-10.6: Minimize soil compaction by using equipment that can reach over sensitive areas and minimizes the pressure exerted on the ground

Select equipment that reduces the amount of pressure exerted on the ground surface, and therefore, reduces erosion potential and/or use overhead or aerial access for transporting equipment across drainage channels. Use equipment that exerts ground pressures of less than 5 or 6 pounds per square inch (PSI), where possible. Low ground pressure equipment includes: wide or high flotation tires (860 to 1850 mm [34 to 72 in] wide);

dual tires; bogie axle systems; tracked machines; lightweight equipment; and, central tire inflation systems. (Construction Site BMP Manual, March 1, 2003)

ABMP-10.7: Where soil compaction is unintended, loosen compacted soils after heavy construction activities are complete

ABMP-10.8: Where vegetation removal is temporary to support construction activities, re-establish native species specific to the project location that comprise a diverse community of woody and herbaceous plants

Caltrans will prepare detailed construction drawings and specifications for implementation of vegetation re-establishment efforts (see Revegetation Guidelines below). Where revegetation is not addressed in the contract plans, vegetation to be reestablished will be determined through consultation within Caltrans relative to landscape, erosion control, and biological needs and commitments.

REVEGETATION GUIDELINES

A. Prior to any planting or seeding, all exotic plants/weeds will be removed from all areas to be revegetated. Mechanical control methods should be employed, if feasible; however, heavy equipment (e.g., bulldozers, backhoes) should not be used to eradicate exotic plants and weeds. In circumstances where mechanical control is not effective, it will be necessary to utilize systemic herbicides that have been approved by the U.S. Environmental Protection Agency (EPA) for use in aquatic situations (e.g., Rodeo by Monsanto).

B. Plant materials for the revegetation effort will be locally obtained. The use of locally obtained materials, which are adapted to local conditions, increases the likelihood that revegetation will be successful, and maintains the genetic integrity of the local ecosystem. For widespread herbaceous species (e.g., California poppy) that are more likely to be genetically homogeneous, site specificity is a less important consideration, and stock from commercial sources may be used.

C. Arrangements will be made well in advance of the start of revegetation to ensure that plant materials are available at the appropriate time. Sufficient time will be allocated for seed collection and contract growing, if necessary (up to 12 months may be required for some woody species).

D. Appropriate native species (as shown in Table E) will be planted and seeded in locations where they are most likely to persist without human assistance after a period of establishment. Most trees and shrubs will be planted from containers or cuttings. Grasses and herbs will be hydroseeded or broadcast seeded and raked into the soil. Trees and shrubs will be planted in random groups to more closely resemble a natural setting and to take advantage of favorable microclimate conditions. Prior to implementation, separate plant palettes and seed mixes will be prepared and will

include specific information such as percent purity/germination, application rates, container plant spacing, etc.

E. During placement of RSP, willow tubes will be inserted between the rock to allow for will cutting installation upon completion of construction

F. Planting and seeding will take place following completion of final grading and/or site preparation (i.e., weed removal and respreading of topsoil), preferably between November 15 and December 31 but not before October 15 or after February 1. These periods may be altered based on an assessment of the current and projected weather pattern at the time of installation.

G. Revegetation areas will be maintained for a minimum of three years following installation. In general, maintenance will include any activities required to meet the performance standards set for this revegetation program.

H. The final success criteria for implementation of this plan will be developed as a goal to determine whether the revegetation effort is successful. Success criteria will include survival and coverage criteria for native vegetation.

I. The revegetation effort will continue for three to five years following installation, based on length of time needed for the revegetation to meet the performance standards. Monitoring will include regular site visits to monitor the maintenance activities and annual performance monitoring to collect data and assess the progress of the revegetation effort.

Revegetation Plant Palletes

Scientific Name	Common Name	Container Size
Riparian Areas		
Salix lasiolepis	Arroyo willow	Cutting or D-40
Alnus rubra	Red alder	D-40
Acer macrophyllum	Big-leaf maple	D-40
Umbellularia californica	California bay	D-40
Rubus ursinus	California blackberry	D-40
Rubus parviflorus	Thimbleberry	D-40
Urtica diocea	Stinging nettle	Seed
Stachys bullata	Hedgenettle	Seed
Lotus purshianus	Spanish clover	Seed
Lupinus nanus	Lupine	Seed
Lupinus bicolor	Miniature lupine	Seed
Claytonia perfoliata	Miner’s lettuce	Seed
Bromus carinatus	California brome	Seed
Hordeum brachyantherum	Meadow barley	Seed
Elymus X triticum	Regreen	Seed
Upland/Cismontane Areas		
Stachys bullata	Hedgenettle	Seed
Lotus purshianus	Spanish clover	Seed
Lupinus nanus	Sky lupine	Seed
Lupinus bicolor	Miniature lupine	Seed
Claytonia perfoliata	Miner’s lettuce	Seed
Eschscholzia californica	California poppy	Seed

Scientific Name	Common Name	Container Size
Nassella pulchra	Purple needlegrass	Seed
Bromus carinatus	California brome	Seed
Hordeum brachyantherum	Meadow barley	Seed
Elymus X triticum	Regreen	Seed

ABMP-11.1: Storage areas will disturb less than 10,000 square meters (2.5 acres) of vegetated or currently undisturbed area

ABMP-11.2: Storage areas will not disturb wetlands or other special status plant communities

ABMP-11.3: For permanent storage areas that have been filled to capacity with sediment and debris, the final configuration will conform to natural contours (elevations, profile, and gradient) of surrounding terrain and, where practicable, native plant species will be established that are specific to the project location that comprise a diverse community of woody and herbaceous plants

ABMP-12.1: Temporary sediment basins shall be cleaned of sediment and the site restored to pre-construction contours (elevations, profile, and gradient) and function

ABMP-14.1: If practicable, work only in dry stream beds or within dry cofferdams

ABMP-14.2: Use existing roadways and stream crossings for temporary access roads whenever reasonable and safe

ABMP-14.3: Minimize the number of access and egress points and total area affected by vehicle operation; locate disturbed areas to reduce damage to existing native aquatic vegetation, substantial large woody debris, and spawning gravel

ABMP-14.4: To the extent practicable, clean culverts and bridge abutments and piers and place RSP and other bank protection by working from the top of the bank or bridge

ABMP-14.5: Limit the duration and extent of in-water activities to the maximum extent practicable

ABMP-14.6: If any life stage of any listed species may be present during in-water activities or substantial disturbance, capture, handling, exclusion, salvage, and relocation will be considered for the listed species

Fish Removal and Relocation, and Stream Dewatering Protocol

Prior to work adjacent to or over project creeks, a fisheries biologist will walk the stream reach immediately above and below the work site and conduct a visual survey for fish. Should fish be observed to be present, work will cease until they can be removed from the area. No ESA listed species are likely to be present during the anticipated timing of the project (late summer-low flow).

Prior to de-watering the site, aquatic life (all vertebrate species) are removed and relocated out of the work area. Fish exclusion is done under the supervision of environmental support staff.

The sequence for fish exclusion is as follows:

- Isolate the area (block nets) upstream and downstream.
- Remove as many fish as possible using seine or dip nets.
- Gradually dewater the work area.
- Remove as many remaining fish as possible using dip nets.
- Electroshock, if required by permit, to avoid any stranding. Any permit specifying electroshocking will be reviewed by NMFS/USFWS in accordance with the draft Memorandum of Agreement establishing fish removal and relocation protocols (NMFS June, 2000).
- Keep records of fish exclusion activities.

Fish and other wildlife removal from the work area is allowable under a special collection permit required by the Washington State Department of Fish and Wildlife (WDFW) includes several conditions intended to minimize harm to fish. A copy of the permit must be in the possession of any persons authorized to collect wildlife, food fish, and/or shellfish.

In order to reduce any impacts to the affected species that are handled during this process, several techniques are used.

Permit conditions require that fish and other vertebrates be removed following these basic steps:

Isolate the Area

Install block nets at up and downstream locations to isolate the entire affected stream reach. Block net mesh size, length, type of material, and depth will vary based on site conditions, but will be installed to block fish and other aquatic wildlife movement into the work area. Generally, block net mesh size is the same as the seine material (9.5 millimeters stretched). These block nets are then left in place throughout the period of work and are checked regularly to ensure that they are functioning properly. Crew supervisors, leads, and/or crewmembers following initial oversight by Environmental staff may check these nets. Block net locations require leaf and debris removal to ensure proper function. The amount of leaves and other debris collected on the net will determine how often the nets need to be checked. An individual must be designated to monitor and maintain the nets. Block nets are installed securely along both banks and in the channel to prevent failure during unforeseen rain events or debris accumulation. Some locations may require additional block net support such as galvanized hardware cloth or additional stakes or metal fence posts.

Fish Removal and Dewatering

Once the stream reach has been isolated, all attempts to remove fish and other aquatic life are made in a manner that involves the least amount of handling. Aquatic life is captured by hand or with dip nets and immediately put in dark colored five gallon buckets filled with clean stream water.

Fish screens will be used around pump(s) so fish are not sucked into pipes and diversion pipe(s). Pumps shall not cause impingement on the screens.

The Stream will be dewatered in two or three stages to allow fish within dewatering section to leave with lowering water.

All available methods will be used to capture fish within the section of the stream to be dewatered.

i) Seining should be first used to capture fish within the stream. This method may not work if substrate is large, reach contains deep pools, or if there are undercut banks or heavy vegetation.

ii) Electrofishing should be conducted after seining. A minimum of three (3) electrofishing passes should be conducted or until no fish are caught or observed. The following are measures to minimize impacts to fish during electrofishing.

a) NOAA Fisheries will be provided written notification 10 working days prior to the initiation of electrofishing.

b) All capture, retention, and handling methods shall be implemented at times that will avoid temperature stress of fish being sampled.

c) All collection and sampling methods shall be implemented at times that will avoid disturbance of spawning fish. Any purposeful take of fish that are actively spawning or are near fish spawning sites is prohibited.

d) Electrofishing will be conducted following the National Marine Fisheries Service’s June 2000 Backpack Electrofishing Guidelines or WDFW Electrofishing Guidelines.

e) Electrofishing will be conducted only by qualified and experienced individuals. A minimum of four (4) individuals will be used for electrofishing.

f) Electrofishing anodes will not be used as nets. Injury and/or death can result from fish being exposed to the electrodes. Separate nets will be used to capture fish.

g) If fish are captured or handled:

- All live fish captured shall be released as soon as possible, and as close as possible to the point of capture.

- The period of time that captured fish are anesthetized shall be minimized. The number of fish that are anesthetized at one time shall be no more than what can be processed within several minutes.

- If fish are held, a healthy environment for the stressed fish must be provided and the holding time must be minimized. Water to water transfers, the use of shaded, dark containers, and supplemental oxygen should all be considered in designing fish handling operations.

- Prior to conducting activities that may involve handling fish, individuals shall ensure that hands are free of sunscreen, lotion, or insect repellent.

Information Logs

Each species and year class is recorded in bound field notebooks. Year class designations will be used to allow a rapid estimate of length to minimize fish handling time. Salmonids with fork lengths approximately 60 millimeters or less will be classed as 0+ age fish; and fish over 60 millimeters will be classed as 1+ age fish. In addition to the species information, field notes will also include other information such as date, personnel, time, general site conditions, weather, stream temperature, conductivity, length of stream reach, methods used, and any other general comments. Data collected is used for research purposes and clear/concise documentation is important.

Fish Release

All collected specimens are to be released unharmed upstream of the isolated stream reach.

ABMP-14.7: Except for streams identified by NOAA Fisheries, USFWS, and DFG as not supporting spawning habitat, conduct all in-water activities outside the spawning and incubation season for listed fish species or to periods identified in cooperation with NOAA Fisheries, USFWS, and DFG to accommodate site-specific conditions

ABMP-14.8: Restore modified or disturbed portions of streams, banks, and riparian areas as nearly as possible to their natural contours (elevations, profile, and gradient)

ABMP-15.1: Maintain stream width, depth, velocity, and slope that provide upstream and downstream passage of adult and juvenile fish according to NOAA Fisheries and DFG guidelines and criteria or as developed in cooperation with NOAA Fisheries and DFG to accommodate site-specific conditions

ABMP-15.2: Where practicable, temporary fills, cofferdams, and diversion cofferdams in stream channels shall be composed of non-erosive materials (e.g., washed, rounded, spawning-sized

gravel between 10 and 100 mm in diameter); gravel in contact with flowing water shall be left in place and allowed to disperse naturally by high winter flows

ABMP-16.1: Avoid disturbance and removal of aquatic vegetation when practicable

ABMP-16.2: Ensure that the limits of disturbance are identified; native vegetation, stream channel substrate, and large woody debris disturbed outside these limits should be replaced if damaged

ABMP-16.3: Remove the minimum amount of wood, sediment and gravel, and other natural debris necessary to maintain and protect culvert and bridge function, ensure suitable fish passage conditions, and minimize disturbance of the streambed

ABMP-16.4: LWD subject to damage or removal shall be retained and replaced on site after project completion or used for other mitigation/restoration projects near the project site where feasible

ABMP-16.5: Minimize disturbed areas by locating temporary work areas to avoid patches of native aquatic vegetation, substantial large woody debris, and spawning gravel

ABMP-16.6: Where vegetation removal is temporary to support construction activities, re-establish native species specific to the project location that comprise a diverse community of aquatic plants

ABMP-16.7: Where spawning gravel removal is temporary to support construction activities, replace spawning gravel to approximate the pre-construction conditions and using, to the extent practicable, gravel removed from the site

ABMP-16.8: Excavated material that will not be placed in the channel or on the bank shall not be stored or stockpiled in the channel and will be end-hauled to an approved disposal site

ABMP-16.9: Gravel and LWD excavated from the channel that is temporarily stockpiled for reuse in the channel will be stored in a manner that prevents mixing with stream flows

ABMP-17.1: Cofferdams and diversion cofferdams shall affect no more of the stream channel than is necessary to support completion of the maintenance or construction activity

ABMP-17.2: Immediately upon completion of in-channel work, remove temporary fills as needed, cofferdams, diversion cofferdams, and other in-channel structures in a manner that minimizes disturbance to downstream flows and water quality

ABMP-17.3: All structures and imported materials placed in the stream channel or on the banks during construction that are not designed to withstand high flows shall be removed before such flows occur

ABMP-18.1: The extent of stream channel desiccation shall be limited to the minimum necessary to support construction activities

ABMP-18.2: Construction of a temporary channel shall proceed from the downstream to the upstream end of the channel

ABMP-18.3: Flow shall not be diverted from the stream channel until the temporary channel is complete and all applicable soil stabilization/control measures are in place

ABMP-18.4: Divert flow the minimum distance necessary to isolate construction area

ABMP-18.5: Water shall be released or pumped downstream at an appropriate rate to maintain downstream flows at all times

ABMP-18.6: For diversion from streams, rivers, and other water bodies, any water intake structure shall be installed, operated, and maintained in accordance with NOAA Fisheries, USFWS, and DFG criteria for the species and life stages of concern or as developed in cooperation with NOAA Fisheries, USFWS, and DFG to accommodate site-specific conditions

ABMP-20.1: To the extent practicable, avoid extending existing areas of stream bank RSP or other bank protection (e.g., sheet piles) and limit the extent of bank and channel armoring to the minimum necessary to protect essential infrastructure

ABMP-20.2: Where practicable, relocate threatened infrastructure to maintain or reestablish natural stream sediment processes

ABMP-20.3: To the extent practicable, bank stabilization shall incorporate bioengineering solutions consistent with site-specific engineering requirements

ABMP-20.4: Where RSP is necessary, incorporate native riparian vegetation and/or LWD in RSP to the extent practicable

ABMP-20.5: Where practicable, the embankment toe shall not extend farther into the active channel than the existing embankment

ABMP-20.6: Where practicable, bank stabilization structures shall not encroach upon the stream thalweg or impair natural flows to secondary channels or wetlands

ABMP-20.7: Pre-wash RSP, sheet piles, and other erosion control materials to remove sediment and/or contaminants

ABMP-20.8: Temporary material storage piles (e.g., RSP) will not be placed in the 100-year floodplain during the rainy season, unless no rain is forecast and material is used within 12 hours of deposition

ABMP-21.1: When concrete is poured to construct bridge footings or other infrastructure in areas of flowing water, work must be conducted to prevent contact of wet concrete with water (e.g., within a cofferdam)

ABMP-23.1: Stream flow through new and replacement culverts, bridges, and over stream gradient control structures must meet the velocity depth, and other passage criteria for salmonid streams as described by NOAA Fisheries and DFG guidelines or as developed in cooperation with NOAA Fisheries and DFG to accommodate site-specific conditions

NMFS recommends three design methods that apply to new and replacement culverts where fish passage is legally mandated or important: the active channel design method, stream simulation design method, and hydraulic design method.

The Active Channel Design method is a simplified design that is intended to size a culvert sufficiently large and embedded deep enough into the channel to allow the natural movement of bedload and formation of a stable bed inside the culvert. As appropriate, the culvert bottom may be filled with cobble or substrate similar to the adjacent reach. Determination of the high and low fish passage design flows, water velocity, and water depth is not required for this method since the stream hydraulic characteristics within the culvert are intended to mimic the stream conditions upstream and downstream of the crossing. This design method is usually not suitable for stream channels that are greater than 3% in natural slope or for culvert lengths greater than 100 feet. Culverts for this design method are typical round, oval, or squashed pipes made of metal or reinforced concrete. Culvert specifications include:

1. Culvert Width - The minimum culvert width shall be equal to, or greater than, 1.5 times the active channel width.

2. Culvert Slope - The culvert shall be placed level (0% slope).

3. Embedment - The bottom of the culvert shall be buried into the streambed not less than 20% of the culvert height at the outlet and not more than 40% of the culvert height at the inlet.

The Stream Simulation Design method is a design process that is intended to mimic the natural stream processes within a culvert. Fish passage, sediment transport, flood and debris conveyance within the culvert are intended to function as they would in a natural channel. Determination of the high and low fish passage design flows, water velocity, and water depth is not required for this option since the stream hydraulic characteristics within the culvert are designed to mimic the stream conditions upstream and downstream of the crossing. The structures for this design method are typically open bottomed arches or boxes but could have buried floors in some cases. These culverts contain a streambed mixture that is similar to the adjacent stream channel. As appropriate, the culvert bottom may be filled with cobble or substrate similar to the adjacent reach. Stream simulation culverts require a greater level of information on hydrology and geomorphology (topography of the stream channel) and a higher level of engineering expertise than the Active Channel Design method. Culvert specifications include:

1. Culvert Width - The minimum culvert width shall be equal to, or greater than, the bankfull channel width. The minimum culvert width shall not be less than 6 feet.

2. Culvert Slope - The culvert slope shall approximate the slope of the stream through the reach in which it is being placed. The maximum slope shall not exceed 6%.

3. Embedment - The bottom of the culvert shall be buried into the streambed not less than 30% and not more than 50% of the culvert height. For bottomless culverts the footings or foundation should be designed for the largest anticipated scour depth.

The Hydraulic Design method is a design process that matches the hydraulic performance of a culvert with the swimming abilities of a target species and age class of fish. This method targets distinct species of fish and therefore does not account for ecosystem requirements of non-target species. There are significant errors associated with estimation of hydraulics and fish swimming speeds that are resolved by making conservative assumptions in the design process. Determination of the high and low fish passage design flows, water velocity, and water depth are required for this option. Fish weirs or fishways may need to be constructed of concrete or other material to facilitate fish passage through the inlet or outlet channels and through the culvert.

The Hydraulic Design method requires hydrologic data analysis, open channel flow hydraulic calculations and information on the swimming ability and behavior of the target group of fish. This design method can be applied to the design of new and replacement culverts and can be used to evaluate the effectiveness of retrofits of existing culverts. Culvert specifications include:

1. Width - The minimum culvert width shall be 3 feet.

2. Slope - The slope through a culvert shall not exceed the slope of the stream through the reach in which it is being placed. If embedment of the culvert is not possible, the maximum slope shall not exceed 0.5%.

3. Embedment - Where physically possible, the bottom of the culvert shall be buried into the streambed a minimum of 20% of the height of the culvert or bridge below the elevation of the tailwater control point downstream of the culvert. The minimum embedment should be at least 1 foot. Where physical conditions preclude embedment, the hydraulic drop at the outlet of a culvert shall not exceed the limits specified above. (Guidelines for Salmonid Passage at Stream Crossings, NMFS, September 2001)

All culvert stream crossings, regardless of the design option used, shall be designed to withstand the 100-year peak flood flow without structural damage to the crossing. The analysis of the structural integrity of the crossing shall take into consideration the debris loading likely to be encountered during flooding. Stream crossings located in areas where there is significant risk of inlet plugging by flood borne debris should be designed to pass the 100-year peak flood without exceeding the top of the culvert inlet (Headwater-to-Diameter Ratio less than one). This is to ensure a low risk of channel degradation, stream diversion, and failure over the life span of the crossing. Hydraulic capacity must be

compensated for expected deposition in the culvert bottom. (Guidelines for Salmonid Passage at Stream Crossings, NMFS, September 2001)

Besides the upper and lower flow limit, other hydraulic effects need to be considered, particularly when installing a culvert. Water surface elevations in the stream reach must exhibit gradual flow transitions, both upstream and downstream. Abrupt changes in water surface and velocities must be avoided, with no hydraulic jumps, turbulence, or drawdown at the entrance. A continuous low flow channel must be maintained throughout the entire stream reach. In addition, especially in retrofits, hydraulic controls may be necessary to provide resting pools, concentrate low flows, prevent erosion of streambed or banks, and allow passage of bedload material.

Culverts should be aligned with the stream, with no abrupt changes in flow direction upstream or downstream of the crossing. This can often be accommodated by changes in road alignment or slight elongation of the culvert. Where elongation would be excessive, this must be weighed against better crossing alignment and/or modified transition sections upstream and downstream of the crossing. In crossings that are unusually long compared to streambed width, natural sinuosity of the stream will be lost and sediment transport problems may occur even if the slopes remain constant. Such problems should be anticipated and mitigated in the project design. (Guidelines for Salmonid Passage at Stream Crossings, NMFS, September 2001)

ABMP-23.2: Where practicable, replace culverts with small bridges

ABMP-23.3: Scour holes at the base of bridge piers or abutments and culvert inlets and outlets shall be repaired by placing no more riprap (RSP) than is necessary to mitigate the scour

ABMP-27.1: The use of potentially less destructive methods will be considered and blasting avoided wherever possible

ABMP-27.2: Blasting shall be conducted outside of the stream channel or under dry channel conditions; blasts will be controlled to prevent flying debris from entering streams

ABMP-27.3: Use of explosives will not be permitted during the spawning period of any listed fish species

ABMP-27.4: Prior to use of any explosives, Caltrans will contact NOAA fisheries, USFWS, and DFG and identify the species and habitats at risk and effective mitigation measures

ABMP-28.1: If individuals of listed species may be present and subject to potential injury or mortality from construction activities, a qualified biologist shall conduct a preconstruction survey

ABMP-28.2: Minimum qualifications for the qualified biologist shall include a 4-year college degree in biology or related field, and 2 years of professional experience in the application of standard survey, capture, and handling methods for the species of concern

ABMP-28.3: When listed species are present and it is determined that they could be injured or killed by construction activities, a qualified biologist shall identify appropriate methods for capture, handling, exclusion, and relocation of individuals that could be affected

ABMP-28.4: Where listed species cannot be captured, handled, excluded, or relocated (e.g., salmonid redd), avoid or delay actions that could injure or kill individual organism until the species leaves the affected area or the organism reaches a stage that can be captured, handled, excluded, or relocated

ABMP-28.5: The project biologist shall conduct, monitor, and supervise all capture, handling, exclusion, and relocation activities; ensure sufficient personnel for safe and efficient collection of listed species; and ensure proper training of personnel in identification and safe capture and handling of listed species

ABMP-28.6: Electrofishing may be allowed only if all other standard fish capture methods would be ineffective; the project biologist must have appropriate training and experience in electrofishing techniques

ABMP-28.7: Individual organisms will be relocated the shortest distance possible to habitat unaffected by construction activities

ABMP-28.8: Within occupied habitat, capture, handling, exclusion, and relocation activities shall be completed no earlier than 48 hours before construction begins to minimize the probability that listed species will recolonize the affected areas

ABMP-28.9: Within temporarily drained stream channel areas, salvage activities shall be initiated before or at the same time as stream area draining and completed within a time frame necessary to avoid injury and mortality of listed species

ABMP-28.10: For projects that involve in-water activities, the project biologist shall continuously monitor in-water activities (e.g., placement of cofferdams, dewatering of isolated areas) for the purpose of removing and relocating any listed species that were not detected or could not be removed and relocated prior to construction

ABMP-28.11: The project biologist will be present at the work site until all listed species have been removed and relocated

ABMP-28.12: The project biologist will maintain detailed records of the species, numbers, life stages, and size classes of listed species observed, collected, relocated, injured, and killed; and the date and time of each activity or observation

ABMP-29.1: Follow the guidance document, developed in cooperation with NOAA Fisheries, USFWS, Corps, and FHWA, to ensure compliance with Program permits and authorization, including implementation of the environmental commitments

ABMP-29.2: Before construction activities begin, the Project Environmental Coordinator or Biologist will discuss the implementation of the required Environmental Commitments with the

Maintenance crew or Construction Resident Engineer and Contractor, and identify and document Environmentally Sensitive Areas and potential occurrence of listed species

ABMP-29.3: Before construction activities begin, the Project Environmental Coordinator or Biologist shall conduct a worker awareness training session for all construction personnel that describes the listed species and their habitat requirements, the specific measures being taken to protect individuals of listed species in the project area, and the boundaries within which project activities shall be restricted

ABMP-29.4: Caltrans shall designate a biological monitor to monitor on-site compliance with all Program Environmental Commitments and any unanticipated effects on listed species

ABMP-29.5: Non-compliance with environmental commitments and unanticipated effects on listed species will be reported to the Resident Engineer or Maintenance Supervisor immediately

ABMP-29.6: When non-compliance is reported, the Resident Engineer or Maintenance Supervisor will implement corrective actions immediately to meet all Environmental Commitments; where unanticipated effects on listed species cannot be immediately resolved, the Resident Engineer or Maintenance Supervisor will stop work that is causing the unanticipated effect

ABMP-29.7: If unanticipated effects on listed species violate the terms and conditions in the BO or other confirmed take authorization, NOAA Fisheries, USFWS, and DFG will be notified as soon as is reasonably possible; modifications to project activities may be developed to prevent continued unanticipated effects

Appendix D Essential Fish Habitat

Appendix D Essential Fish Habitat

D.1 Background

Public Law 104-297, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Fishery Conservation and Management Act to establish new requirements for essential fish habitat (EFH) descriptions in federal fishery management plans and to require federal agencies to consult with NMFS on activities that may adversely affect EFH.

The Magnuson-Stevens Act requires all fishery management councils to amend their fishery management plans to describe and identify EFH for each managed fishery. The Pacific Fishery Management Council (1999) has issued such an amendment in the form of Amendment 14 to the Pacific Coast Salmon Plan, and this amendment covers EFH for all fisheries under NMFS jurisdiction that would potentially be affected by the covered activities. Specifically, these are the Chinook salmon, coho salmon and Puget Sound pink salmon (which does not occur in the coverage area) fisheries. EFH includes all streams, lakes, ponds, wetlands, and other currently viable water bodies and most of the habitat historically accessible to salmon. Activities occurring above impassable barriers that are likely to adversely affect EFH below impassable barriers are subject to the consultation provisions of the Magnuson-Stevens Act.

The Magnuson-Stevens Act requires consultation for all federal agency actions that may adversely affect EFH. EFH consultation with NMFS is required by federal agencies undertaking, permitting, or funding activities that may adversely affect EFH, regardless of its location. Under Section 305(b)(4) of the Magnuson-Stevens Act, NMFS is required to provide EFH conservation and enhancement recommendations to federal and state agencies for actions that adversely affect EFH. Wherever possible, NMFS utilizes existing interagency coordination processes to fulfill EFH consultations with federal agencies. For the covered activities, this goal is being met by incorporating EFH consultation to the Programmatic Endangered Species Act Section 7 consultation, as represented by this PBA.

D.2 Location

The coverage area has been described in detail earlier in this document (Chapter 3).

D.3 Description of Covered Activities

The activities covered by this assessment have been described in detail earlier in this document (Chapter 5).

D.4 Occurrence of Essential Fish Habitat

Species from the groundfish, coastal pelagic, and Pacific salmon guilds may occur within the coverage area.

Designated EFH for these guilds is correlated with the life history stages that may occur in the project action area, and summarized for groundfish (Table D-1), salmonids (Table D-2), and coastal pelagic species (Table D-3).

Table D-1. Ground Fish Species with Designated EFH and the Life History Stages that May Occur in the Project Action Area

Ground Fish Species	Adults	Spawning/Mating	Juvenile	Larvae	Eggs/Parturition
Soupfin Shark	X	?	?		?
Spiny Dogfish	X	X	X		X
California Skate	X				
Ratfish	X				X
Lingcod	X	X	X	X	X
Cabezon	X	X	X	?	X
Kelp Greenling	X	X	X	X	X
Pacific Cod	X	X	X	X	X
Pacific Whiting (Hake)	X	X	X	X	X
Sablefish	X		X		
Black Rockfish	X		X		
Blackgill Rockfish			X	X	
Blue Rockfish	X		X	X	
Bocaccio	X	?	X	X	
Brown Rockfish	X	?	X	X	
Canary Rockfish	X	?	X	X	
Chillipepper	X	?	X	X	
China Rockfish	X	?	X	?	
Copper Rockfish	X		X	?	
Darkbloched Rockfish	X		X		
Greenspotted Rockfish	X		X		
Greenstriped Rockfish	X		X		
Pacific Ocean Perch	X		X		
Quillback Rockfish	X		X	?	
Redbanded Rockfish	X				
Redstriped Rockfish	X				
Rosethorn Rockfish	X		X		
Rosy Rockfish	X		X		
Rougheye Rockfish	X		?		
Sharpchin Rockfish	X		?		
Shortbelly Rockfish	X		?		
Shortraker Rockfish	X				
Shortspine Thornyhead	X		X		
Silvergray Rockfish	X				
Splitnose Rockfish	X		X		
Stripetail Rockfish	X				
Tiger Rockfish	X		X		
Vermillion Rockfish	X	?	X		
Widow Rockfish	X	?	X	X	
Yelloweye Rockfish	X				
Yellowmouth Rockfish	X				

Ground Fish Species	Adults	Spawning/Mating	Juvenile	Larvae	Eggs/Parturition
Yellowtail Rockfish	X	?	X		
Arrowtooth Flounder	X	X	X		
Butter Sole	X	X	X		
Curlfin Sole	X				
Dover Sole	X	X	X		
English Sole	X	X	X	X	X
Flathead Sole	X	X	X	X	X
Pacific Sand dab	X		X	X	X
Petrale Sole	X		X	X	X
Rex Sole	X	X	X		X
Rock Sole	X	X	X	X	X
Sand Sole	X	X	X	X	?
Starry Flounder	X	X	X	X	X

Source: PFMC 1999

Table D-2. Pacific Salmon Species with Designated EFH and the Life History Stages that May Occur in the Project Action Area

Pacific Salmon	Egg	Larvae	Juvenile	Adult	Spawning
Chinook salmon	X	X	X	X	X
Coho salmon	X	X	X	X	X

Source: PFMC 1999

Table D-3. Coastal Pelagic Species with Designated EFH and the Life History Stages that May Occur in the Action

Coastal Pelagic Species	Adult	Spawning/ Mating	Juvenile	Larvae	Eggs/ Parturition
Northern Anchovy	X	X	X	X	X
Pacific Sardine	X	X	X	X	X
Pacific Mackerel	X	X	?	?	?
Jack Mackerel	X	X	X	X	X
Market Squid	X	?	?	X	X

Source: PMFC 1999

D.5 Groundfish Essential Fish Habitat

Effects to the environmental baseline that would impact groundfish species are discussed in detail in Chapters 6.

D.6 Pacific Salmon Essential Fish Habitat

Effects to the environmental baseline that would impact salmonid species are discussed in detail in Chapters 6.

D.7 Coastal Pelagic Species Essential Fish Habitat

Effects to the environmental baseline that would impact coastal pelagic species are discussed in detail in Chapters 6.

D.8 Essential Fish Habitat Minimization Measures

Minimization measures designed to protect species protected under the federal ESA will also help avoid and minimize impacts of the covered activities on salmonid and groundfish EFH. A complete list of minimization measures is provided in Appendix C.

D.9 Conclusions

In accordance with EFH requirements of the Magnuson-Stevens Fishery Conservation and Management Act, it has determined that the covered activities will adversely impact EFH utilized by Pacific salmon, while the covered activities will not adversely impact EFH utilized by groundfish, or coastal pelagic species. This determination is based upon the nature of the covered activities, which include the routine maintenance, repair and replacement of existing infrastructure and the protection of existing infrastructure. The construction of any new infrastructure that may modify or otherwise remove existing EFH for any of the three guilds of species is not covered under this PBA. It has been determined that the covered activities may temporarily affect EFH for federally managed fisheries in California waters; and may modify the environmental baseline or habitat conditions for Pacific salmon over time, however, it is anticipated that activities covered under this PBA will not modify the environmental baseline or habitat conditions over time for groundfish or coastal pelagic species.

Appendix E Take Assessment

Appendix E Take Assessment

E.1 Introduction

The covered activities include 14 SSPs. The 14 SSPs are further broken down by 30 PAs, of which specific PAs are, or may be required to complete a particular SSP, as discussed in Chapter 5. The effects analysis of the 30 PAs provided in Chapter 6 concludes that two PAs could result in an adverse effect to covered species, or the "take" of a federally protected species. These two PAs include:

- PA-27: Blast rock and other substrate, and
- PA-28: Capture, handle, exclude, salvage, and relocate species

Other PAs could also result in take, if they were implemented without PA-28, such as PA-14, (operate construction equipment and vehicles in the stream channel). However, the PAs that could potentially result in the stress, injury or mortality of a federally protected species (i.e. "take") will not be implemented without also implementing PA-28, which will be employed to isolate a work area and permit other PAs to be implemented without the potential to result in take. "Take," according to Section 3(19) of the federal Endangered Species Act, "*means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.*"

Overall, the primary approach to implementing all PAs is to preclude working within or around sites when they are wetted or contain listed fish species. As such, PA 28 would be implemented only as a last option and only after the approach to implementing PA 28 is clearly defined and accepted by NMFS for the specific application.

PA-27 has been identified as a PA that may be required to complete two SSPs in certain circumstances, including:

- SSP-1.1: Removal of slide and alluvial debris and soil from roadways, road shoulders, and side slopes, and
- SSP-1.2: Stabilization of side slopes to minimize debris slides and damage to roads.

PA-28 has been identified as a PA that may be required to complete eight SSPs in certain circumstances, including:

- SSP-1.3: Stabilization of stream banks and channels to minimize erosion and damage to adjacent roads, bridges and culverts
- SSP-3.1: Cleaning of drainage channels and ditches to maintain function and avoid damage to adjacent roads
- SSP-3.2: Cleaning of sediment and debris from culverts and bridge abutments and supports to minimize erosion and damage to racks, culverts and bridges and to maintain stream flow conditions
- SSP-3.3: Rehabilitation of culverts to maintain function

- SSP-3.4: Replacement, repair and retrofitting of culverts to maintain function and, where practicable, improve flow conditions to support fish passage and sediment transport
- SSP-4.1: Repair of bridges to maintain function
- SSP-4.2: Rehabilitation of small bridges to maintain bridge function and meet current standards and specifications (e.g. earthquake standards)
- SSP-4.3: Replacement of small bridges to maintain bridge function, meet current standards and specifications, and where practicable, improve flow conditions for fish passage and sediment transport

PA-27 may be implemented adjacent to streams where covered species may be present. Adhering to the setback distances established in Chapter 6 (refer to Table 6.2) will avoid and minimize potential impacts to covered species, and thus no take is anticipated when implementing this PA.

To complete the take assessment for this programmatic consultation, Caltrans compiled the following information:

- The anticipated frequency that SSPs will be completed by Caltrans on an annual basis within the coverage area, extrapolated from there to the PA scale and further adjusted based on Caltrans experience in implementing these SSPs
- The length of stream channel potentially affected by implementing specific SSPs
- The densities of federally protected fish that have been documented in streams located within the coverage area

The frequency of each SSP, and thus each PA, is based on conversations with those Caltrans District staff responsible for performing/implementing these activities. Caltrans will monitor the frequency of the activities over the life of the PBA and coordinate with the NMFS to ensure the frequencies reflected in the PBA are accurate. However, the frequency of a specific SSP can vary from year-to-year based on several factors. For example, culvert cleaning will be required more frequently in years with heavy rainfall compared to a drought year. Table E-1 provides the general frequency of each SSP that may require PA-27 and/or PA-28 to be completed, for each Caltrans District.

The length of stream channel potentially affected when implementing a particular SSP is also based on conversations with Caltrans District staff that are responsible for performing/implementing these activities. Caltrans will also monitor the length of stream channel typically affected by the covered activities over the life of the PBA and coordinate with NMFS to ensure the length of channel typically affected by each SSP is accurate. However, the length of channel affected by a specific SSP can vary from one stream to the next due to width, flow, etc. For example, cleaning drainage channels and ditches may require more than 500 feet be cleaned in one channel/ditch but only 50 feet in another channel/ditch. Over the course of the PBA, Caltrans expects the length of channel potentially affected by the SSPs presented below to be accurate for consideration of what typically occurs. Caltrans will monitor the length of channel affected when implementing the SSPs and coordinate with NMFS to ensure the lengths of channel affected are accurate.

Table D.1 below, provides the length of channel typically affected as well as the frequency of the SSPs identified above as requiring PAs that could potentially result in take of covered species, for each Caltrans District.

Table E-1. Frequency of SSPs That Could Result in Take and Length of Channel Potentially Affected

Site-Specific Project	Channel ** Distance Affected in meters and (feet) per SSP	Frequency by District		
		D1 [length of channel affected per year]	D2 [length of channel affected per year]	D3 [length of channel affected per year]
SSP-1.1: Removal of slide and alluvial debris and soil from roadways, road shoulders, and side slopes [PA-27]	**0**	**35**	**10**	**40**
SSP-1.2: Stabilization of side slopes to minimize debris slides and damage to roads [PA-27]	**0**	**30**	**10**	**20**
SSP-1.3: Stabilization of slide and alluvial debris and soil from roadways, road shoulders, and side slopes [PA-28]	**152.4 (500)**	**30** [4,572 m (15,000 ft)]	**10** [1,524 m (5,000 ft)]	**20** [3,048 m [10,000 ft)]
SSP-3.1: Cleaning of drainage channels and ditches to maintain function and avoid damage to adjacent roads [PA-28]	**152.4 (500)**	**15** [2,286 m (7,500 ft)]	**10** [1,524 m (5,000 ft)]	**40** [6,096 m (20,000 ft)]
SSP-3.2: Cleaning of sediment and debris from culverts and bridge abutments and supports to minimize erosion and damage to roads, culverts and bridges and to maintain stream flow conditions [PA-28]	**15.24 (50)**	**8,000**[A] [121,900 m (400,000 ft)]	**350**[A] [5,334 m (17,500 ft)]	**9,000**[A] [137,160 m (450,000 ft)]
SSP-3.3: Rehabilitation of culverts to maintain function [PA-28]	**30.48 (100)**	**30** [914 m (3,000 ft)]	**30** [914 m (3,000 ft)]	**30** [914 m (3,000 ft)]
SSP-3.4: Replacement, Repair and Retrofitting of culverts to Maintain Function and, Where Practicable, Improve Flow Conditions to Support Fish Passage and Sediment Transport [PA-28]	**30.48 (100)**	**150** [4,572 m (15,000 ft)]	**80** [2,438 m (8,000 ft)]	**60** [1,829 m (6,000 ft)]
SSP-4.1: Repair of bridges to maintain function [PA-28]	**30.48 (100)**	**50** [1,524 m (5,000 ft)]	**30** [914 m (3,000 ft)]	**60** [1,829 m (6,000 ft)]
SSP-4.2: Rehabilitation of small bridges to maintain bridge function and meet current standards and specifications (e.g., earthquake standards) [PA-28]	**30.48 (100)**	**10** [1,524 m (5,000 ft)]	**5** [152 m (500 ft)]	**10** [1,524 m (5,000 ft)]
SSP-4.3: Replacement of small bridges to maintain bridge function, meet current standards and specifications, and, where practicable, improve flow conditions for fish passage and sediment transport [PA-28]	**30.48 (100)**	**5** [152 m (500 ft)]	**5** [152 m (500 ft)]	**5** [152 m (500 ft)]

**Note – SSP-1.1 and SSP-1.2 will not impact stream channels. Generally these activities occur in drainage channels and similar man-made conveyances and are conducted from Caltrans managed roadways .

A Note - A large percentage of the annual frequency, likely greater than 95 percent of this SSP involve low impact activities which would not have many related PAs. Most of the cleaning involves removal of sticks and leaves from culvert inlets and removal of very small amounts of sediment (3 to 4 shovels' full worth on average). Most of this type of work is done by hand, usually after the first couple of storms each year.

Caltrans worked closely with NMFS to complete a thorough review of the available scientific literature to estimate the density of federally protected juvenile fish species under NMFS jurisdiction (i.e. Chinook salmon, coho salmon and steelhead) where present within the coverage area. The density data was provided for various streams and rivers within the coverage area. The data reviewed provided estimates of density of fish in various metrics, including fish/meter, fish/kilometer, fish/meter^2, and fish/meter^3. Because of the difficulty in quantifying the extent of impacts at the square meter or cubic meter scale (due to variations in channel dimensions and water depths likely to be encountered across the coverage area during the life of the PBA), it was decided to apply the density metric of fish/meter and fish/kilometer to assess the potential take associated with the covered activities.

Table E-2 below, provides the estimated density for the species covered in this PBA. The fish density data was not available for most of the HSAs, or for individual ESU/DPSs. Therefore, in order to estimate take, the available data for a species was combined to generate a range of metrics. The average of the density data is provided with the high- and low-end of the density range presented in the literature reviewed, as well as the 90th percentile density.

Table E-2. Density Data for Covered Species within the Coverage Area where listed species were observed

Species	Average Density Across Coverage Area	Highest Density within the Coverage Area	Lowest Density within the Coverage Area	90th Percentile Density
Coho Salmon	0.278 coho/meter (0.08 coho/foot)	0.984 coho/meter (0.30 coho/foot)	0.03 coho/meter (0.01 coho/foot)	0.53 coho/meter (0.02 coho/foot)
Steelhead	0.341 steelhead/meter (0.10 steelhead/foot)	2.68 steelhead/meter (0.82 steelhead/foot	0.03 steelhead/meter (0.01 steelhead/foot	0.722 steelhead/meter (0.22 steelhead/foot)
Chinook Salmon	No data located	N/A	N/A	N/A

It should be noted that all stream reaches within the coverage area do not currently contain coho salmon. The average density of coho for all stream reaches would be dramatically less than that provided in Table E-2, as the number of sites with zero fish would be substantially less than the number of sites with more than zero fish (Brown et al 1991; Brown and Moyle 1991).

No data specific to the density of Chinook salmon juveniles within the coverage area were located. Many of the Chinook salmon within the coverage area are ocean-type Chinook salmon and thus are out of the streams and into the estuaries within the coverage area in the spring to early-summer and thus likely avoid detection. Similarly, those SSPs that could result in take will primarily occur when ocean-type Chinook salmon should not be present in the streams within the coverage area, as these activities will occur after residual Chinook salmon juveniles have migrated out of streams and rivers and into estuaries. No data on the density of juvenile salmonids in estuaries was located.

E.2 Extent of Take

The extent of take presented in this assessment has been calculated for each Caltrans District within the coverage area, based on the frequency of PA-28 within the coverage area multiplied by the length of stream channel expected to be affected. This number is then multiplied by the estimated density of juvenile fish in Table E-2. The density of juvenile fish is a range that includes both the average of the density data that has been collected from streams within the coverage area, as well as the 90th percentile. This range is used to provide a reasonable range of expected juvenile fish density, and thus the potential extent of expected take based on the federal ESA definition of "take." The expected mortality is also estimated, based on a mortality rate of 3 to 5 percent of all fish captured/handled.

The potential extent of take has been calculated for each Caltrans District within the coverage area, based on the frequencies that are greater than have occurred during the past and are considered to be liberal. Thus, the estimate is likely an overestimate of the potential extent of take. The frequencies for the PAs are much less than if they were extrapolated from the SSP scale, since not every PA identified as potentially required to implement each SSP will necessarily be required to implement a specific SSP, such as SSP-3.2. For example, PA-28 will not be implemented when implementing an SSP in an ephemeral stream, when the stream is dry.

Table E-3. Estimated Frequency of PA-27 and PA-28 per Caltrans District.

Project Action	Caltrans District 1	Caltrans District 2	Caltrans District 4	Total
PA-27: Blast rock and other substrate	0	0	0	**0**
PA-28: Capture, handle, exclude, salvage, and relocate listed species	2	1	2	**5**
Total for PA-27 and PA-28	**2**	**1**	**2**	**5**

PA-27 may be implemented adjacent to streams where covered species may be present. Adhering to the setback distances established in Chapter 6 (refer to Table 6.2) will avoid and minimize potential impacts to covered species, and no take is anticipated.

Implementing PA-28 will result in take as defined by the federal Endangered Species Act. The extent of take associated with PA-28 is provided for each Caltrans District in Table E-4 and Table E-6 below. To calculate the extent of take, the linear distance of channel affected by each SSP which may require PA-28 (about 100 m) is multiplied by the frequency that SSP will be implemented in each Caltrans District. This provides the total linear distance of channel potentially affected on an annual basis for each SSP. This linear distance is then multiplied by the average density and the 90th percentile density of covered fish species, to provide the total number of fish, per Caltrans District that may be adversely affected.

Table E-4. Anticipated Extent of Take per Caltrans District

Action	Total Length of Channel Affected in meters per District	Average and 90th Percentile Density Data			Anticipated Extent of Take per Caltrans District		
		Chinook	Coho	Steelhead	Chinook	Coho	Steelhead
PA-28	D1 – 200 m	-	Ave = 0.278/m 90th = 0.53/m	Ave = 0.341/m 90th = 0.722/m	-	56 108	68 145
	D2 – 100 m				-	28 54	34 72
	D4 – 200 m				-	56 108	68 145
Total (mean)					Unknown	140	170
Total (90th percentile)					Unknown	270	362

E.3 Monitoring and Reporting

The extent of take presented in this assessment is broad-brush, it does provide a sense of the extent of take that could occur when implementing the covered activities presented in the PBA. However, the estimated extent of take presented here is expected to be an over-estimate of the actual extent of take that will occur when implementing the covered activities.

Caltrans will monitor the parameters used to estimate the extent of take described herein (frequency PAs are implemented, length of channel affected per SSP, as well as the extent of take (fish captured, handled and observed mortality) that occurs as a result of the SSPs implemented and covered under this PBA. Caltrans will report any concerns and communicate with the NMFS on the extent of take that is occurring on a schedule acceptable to both Caltrans and NMFS.

E.4 References

Brown, L.R., P.B. Moyle, and R.M.Yoshiyama. 1991. Historical decline and current status of coho salmon in California. N. Amer. J. Fish. Mgmt. 14:237-261.

Brown, L.R. and P.B.Moyle. 1991. Status of coho s almon in California, Report to the National Marine Fisheries Service. Department of Wildlife and Fisheries Biology, University of California Davis, CA 95616 1 July 1991.