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SUBMITTAL TRANSMITTAL

Submittal	Specification Section	Revision
002.3	**18.01.01**	**3**

Santa Clara Valley Water District
C/O Mott Macdonald
181 Metro Dr, Suite 510
San Jose, CA 95110
Attention: Brian Wiedmann

Project:
San Francisquito Creek Flood Reduction, Ecosystem Restoration and Recreation Project

Reference: SWPPP Plan

Item #:	Submittal Review Status				Drawing/ Item	Dated	Specification/ Drawing Reference #:	Description
	1 Reviewed/ No Exceptions Taken	**2** Make Corrections Noted	**3** Amend as Noted and Resubmit	**4** Rejected and Resubmit				
1						7/11/16	18.01.01	SWPPP
2								
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Comments: Comprehensive SWPPP plan which covers BMP’s and QSD. Revised.

Date Submitted: 7/11/16

Submitted By: Travis Grande

Storm Water Pollution Prevention Plan

For:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION AND RECREATION PROJECT

CLIENT:
SANTA CLARA VALLEY WATER DISTRICT
5750 Almaden Expressway
San Jose, CA 95118

PROJECT SITE LOCATION/ADDRESS:
San Francisquito Creek, STA 0+00 to 77+71

SWPPP PREPARED BY:

MONTGOMERY
& ASSOCIATES, INC.

1100 CORPORATE WAY, SUITE 140
SACRAMENTO, CA 95831
(916) 476-4903
Scott Berkebile, PE, CFM, QSD/QSP
Stormwater Services Manager

SWPPP PREPARATION DATE:
7/11/2016

WDID NUMBER: ______________

Contents

SWPPP Attachments

Section 100 - SWPPP Certifications and Approval

100.1 SWPPP Certification by Qualified SWPPP Developer

Project Name: San Francisquito Creek Flood Reduction, Ecosystem Restoration and Recreation Project

Contract No: C0163

"I certify under a penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

	July 11, 2016
Qualified SWPPP Developer's Signature	Date
Scott Berkebile, PE, QSD/QSP	(916) 476-4903
Preparer's Name and Title	Phone Number

100.2 SWPPP Acceptance and Submittal by Legally Responsible Person

Project Name: San Francisquito Creek Flood Reduction, Ecosystem Restoration and Recreation Project

Contract No: C0163

Owner: Santa Clara Valley Water District

Legally Responsible Person certifies all permit registration documents in the State's SMARTS system.

San Francisquito Creek Joint Powers Authority	
Legally Responsible Person	Date
Len Materman - Executive Director	(650) 324-1972
Name and Title	Phone Number

100.3 Annual Report & Certification

The Legally Responsible Person shall certify that the Annual Report (due by September 1 of each year) was prepared in accordance with the Special Provisions of the Permit.

Legally Responsible Person certifies all SWPPP Annual Report documents in the State's SMART system.

San Francisquito Creek Joint Powers Authority	
Legally Responsible Person	Date
Len Materman - Executive Director	(650) 324-1972
Name and Title	Phone Number

Section 200 - SWPPP Amendments

200.1 SWPPP Amendment Certification and Approval

This SWPPP shall be amended:

- Whenever there is a change in construction or operations which may affect the discharge of pollutants to surface waters, groundwater(s), or a municipal separate storm sewer system (MS4); or
- If any condition of the Permit is violated or the general objective of reducing or eliminating pollutants in storm water discharges has not been achieved; and
- When deemed necessary by the QSD.

The following items will be included in each amendment:

- Who requested the amendment.
- The location of proposed change.
- The reason for change.
- The original BMP proposed, if any.
- The new BMP proposed.

The QSD is the only person authorized to develop and certify amendments. The QSD is also the only person allowed to approve any changes to BMPs. The amendments for this SWPPP must be certified by the QSD. That certification form, along with the LRP's Acceptance of the amendment, can be found in the following pages. Amendments are listed in the Amendment Log in section 200.2, and attached in Attachment U.

SWPPP Amendment No. _____

Project Name: San Francisquito Creek Flood Reduction, Ecosystem Restoration and Recreation Project

Contract No: C0163

QSD Certification of the SWPPP Amendment

"I certify under a penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

____________________	____________
Qualified SWPPP Developer's Signature	Date
Scott Berkebile, PE, QSD/QSP	(916) 476-4903
Preparer's Name and Title	Phone Number

LRP Acceptance of the SWPPP Amendment

Legally Responsible Person certifies all SWPPP amendment documents in the State's SMART system.

San Francisquito Creek Joint Powers Authority	____________
Legally Responsible Person	Date
Len Materman - Executive Director	(650) 324-1972
Name and Title	Phone Number

200.2 Amendment Log

Project Name: San Francisquito Creek Flood Reduction, Ecosystem Restoration and Recreation Project

Contract No: C0163

Amendment No.	Prepared Date	Brief Description of Amendment	Accepted Date

Section 300 - Project Description

300.1 Introduction and Project Description

The proposed project is located within the San Francisquito Creek, in East Palo Alto and Palo Alto, in both San Mateo and Santa Clara Counties. The site is bounded on the southwest by US Highway 101 and to the northeast by San Francisco Bay.

San Francisquito Creek is a tidal channel bordered by levees on both sides that have overtopped resulting in flooding to adjacent properties, most recently in 2012. One of the fundamental purposes of the project is to keep stormwater from flowing over streets and through homes before it enters the Bay, and instead to transmit stormwater within a marshplain channel. The current channel capacity is 5,300 cubic feet per second (cfs). A Caltrans Highway 101 project scheduled to be completed in 2017, and a future project planned by the San Francisquito Creek Joint Powers Authority (SFCJPA), will increase downstream flows to 7,400 cfs. This Project is designed to convey 9,400 cfs during extreme tides with allowance for 26 inches (approximately 50 years) of anticipated sea level rise. This will be accomplished by widening the creek channel to create a new marsh floodplain, construct floodwalls in areas constrained by existing adjacent infrastructure, and remove and rebuild levees to current engineering standards. The project will create 15.14 acres of new and restored marsh.

Project components consist of: removing approximately 5,300 feet of existing levees, constructing 5,689 feet of new levees, replacing and constructing bike and pedestrian paths, including a 16-foot wide by 2,650-foot long paved Bay Trail portion that can also be used for levee maintenance, ramps to access the new trails, including pedestrian ramps and boardwalk, reconstructed concrete pipe stormwater outfalls, new rock slope protection and restored native vegetation.

The project will require utility line realignment, vegetation removal as well as sheet pile installation for the new floodwalls. The realignment of the gas transmission pipeline by Pacific Gas and Electric (PG&E) will be covered by PG&E's LUP type SWPPP Segment Amendment under their 2016 Gas Transmission Programmatic – Region 2 SWPPP, WDID No. 2 41C375808. Utility replacement by

East Palo Alto Sanitary District, new vegetation plantings within the Faber Marsh Tract levee adjacent to the Project, construction of in-channel root wad structures to reduce flow velocity for endangered steelhead, and construction of five new island refugia in Faber Marsh for endangered marsh species are planned to be added to this project as additional construction activities. Once more information is known about locations and durations, the SWPPP will be amended with new locations and BMPs.

The SFCJPA and SCVWD (or designee) will coordinate and oversee construction activities so that each project element achieves the same outcome of protecting water quality during construction. For this project, oversight will be supplied by Rachael Keish, PE, QSD/P, and other staff of Keish Environmental, San Jose, CA.

Proposed construction is estimated to begin July 25, 2016 and expected completion date is December 31, 2018.

300.2 Unique Site Features

The project lies north of US Highway 101 and travels northeast ending at the San Francisco Bay. The site's topography is mild as the site has elevations averaging just above sea level throughout the project.

The San Francisquito Creek is on the California 303(d) list for Diazinon, Sedimentation/Siltation, and Trash. The San Francisquito Creek is considered a sediment-sensitive water body as it has beneficial uses of COLD, MIGRATORY, AND SPAWN. The project lies within the San Francisco Bay Watershed. The project and surrounding area is home to many protected species and environmentally sensitive areas.

300.3 Risk Determination

The risk assessment for this project was conducted using up to date information on the project site's soil erodibility, slope length, rain pattern properties, and receiving waterbodies. Based on this set of criteria, it was determined and confirmed with SMARTS that the project met the requirements to be classified as a Risk Level 2 project. The project's risk assessment is found in Attachment K.

Project Start Date: July 25, 2016

Estimated Project Completion Date: December 31, 2018

* These dates are approximate dates, should the project timeline be revised, the project's risk will be re-assessed.

300.4 Construction Site Estimates

The project increases impervious surface by approximately 1 acre in the form of a proposed paved 16-foot, 2,650-foot long pathway. The remaining areas of construction will keep the percentage of impervious surfaces as pre-construction conditions. The following are estimates of the construction site:

Construction site area	35 acres
Percentage impervious area before construction	7%
Runoff coefficient before construction(1)	0.25
Percentage impervious area after construction	10%
Runoff coefficient after construction(1)	0.27

(1) Calculations are shown in Attachment D

Flow is anticipated to run-on to the construction site due to the existing drainage infrastructure which flows directly into the San Francisquito Creek. A significant majority of run-on flows will concentrate in the center of the channel while most of the construction activities will occur along the side slopes (levees) of the creek. Detailed run-on calculations can be found in the *San Francisquito Creek Hydrology Study, Draft Final*, dated July 2015.

300.5 Contact Information of Qualified SWPPP Practitioner

The Primary Qualified Storm Water Pollution Prevention Plan Practitioner (QSP) assigned to this project is:

Douglas L. Wathen, CESSWI, QSP
Montgomery & Associates, Inc.
1100 Corporate Way, Suite 140
Sacramento, CA 95831
(916) 476-4903
doug@montgomery-assoc.com

The Secondary Qualified Storm Water Pollution Prevention Plan Practitioner (QSP) assigned to this project is:

Mike Wathen, CPESC, CPSWQ, QSD/QSP
Montgomery & Associates, Inc.
1100 Corporate Way, Suite 140
Sacramento, CA 95831
(916) 476-4903
mike@montgomery-assoc.com

The QSP is the person responsible for overseeing non-storm water and storm water visual observations, sampling and analysis. Duties of the QSP are as follows:

At the job site:

1. Be responsible for water pollution control (WPC) work
2. Be the primary contact for WPC work
3. Oversee the maintenance of WPC practices
4. Oversee and enforce hazardous waste management practices
5. Have the authority to mobilize crews to make immediate repairs to WPC practices
6. Ensure that all employees have current water pollution control training
7. Implement the accepted SWPPP

The QSP must oversee:

1. Inspections of WPC practices identified in the SWPPP
2. Inspections and reports for visual monitoring

3. Preparation and implementation of REAP's
4. Sampling and analysis
5. BMP Status Reports

The QSD job duties include (and cannot be performed by the QSP):

1. SWPPP annual certification
2. Annual reports
3. SWPPP Amendments
4. Review of QSP reports

Section 400 - References

The following, plans, permits, reports, manuals, documents, etc. are made a part of this SWPPP by reference. Attachment M includes copies of other local or project-specific permits:

- Project Site Plan for San Francisquito Creek Flood Reduction, Ecosystem Restoration and Recreation Project
- State Water Resources Control Board Order No. 2009-0009-DWQ, as amended 2012-0006-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities, and Attachment D - Risk 2 Requirements.
- San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan), 2007
- U.S. Army Corps of Engineers CWA Section 404 Permit, May 25, 2016 USACE Permit Modification, and Regional Water Quality Control Board/State Water Resources Control Board CWA Section 401 Water Quality Certification.
- Department of Fish and Game 1602 Stream Bed Alteration Agreement.
- RWQCB 401 Water Quality Certification
- Bay Conservation and Development Commission Permit
- Endangered Species Act Biological Opinions from the U.S. Fish and Wildlife Service and the National Marine Fisheries Service;
- Special Use Permit from the Don Edwards San Francisco Bay National Wildlife Refuge.
- San Francisquito Creek Hydrology Study, Draft Final, July 2015
- Post Construction Stormwater Management Plan, Draft, May 2016

Section 500 - Body of SWPPP

500.1 Objectives

This Storm Water Pollution Prevention Plan (SWPPP) has been designed to address the following objectives:

- To control all pollutants and their sources, including sources of sediment associated with construction, construction site erosion and all other activities associated with construction activity;
- To identify and eliminate, control or treat all non-storm water discharges, except where not otherwise required to be under a Regional Water Board permit;
- To place site BMPs that are effective and result in the reduction or elimination of pollutants in storm water discharges and authorized non-storm water discharges from construction activity to the BAT/BCT standard;
- To provide complete and correct calculations and design details, as well as BMP controls, to address and handle site run-on; and
- To install stabilization BMPs which reduce or eliminate pollutants after construction is complete.

This SWPPP conforms to the required elements of the General Permit No. 2012-0006-DWQ, CAS000002 issued by the State of California, State Water Resources Control Board (SWRCB) on September 2, 2009. Compliance with the Permit shall continue throughout all phases of construction until all conditions for Termination can be achieved, or all (or portions) for the site have been transferred to a new owner. As a result, this SWPPP will be modified and amended to reflect any amendments to the Permit or any changes in construction or operations that may affect the discharge of pollutants from the construction site. The SWPPP will also be amended if it is in violation of any condition of the Permit or has not achieved the general objective of reducing pollutants in storm water discharges. The SWPPP shall be readily available on-site for the duration of the project.

500.2 Vicinity Map

The construction project vicinity map showing the project location is located in Attachment A.

500.3 Pollutant Source Assessment

An estimation of potential pollutant sources shall be identified and listed herein. Any additional control measures to reduce or prevent pollutants in storm water runoff and authorized non-storm water discharges shall be identified. The list shall include all non-visible pollutants known to occur on the construction site.

Control measures shall consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site. BMPs shall also consider the degree to which pollutants associated with those materials may be exposed to, and mobilized by contact with storm water. Additionally, consideration will be made for the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

For the purposes of this section a check of groundwater contamination sites in the project vicinity was made on the SWRCB's GeoTracker geographic information system website (http://www.geotracker.waterboards.ca.gov) and 3 sites were found within 1,000 feet of the site. A table of the Identified sites and contaminants can be found in Attachment M. Additionally it is known that there are existing pipelines that are either suspected or confirmed to contain asbestos. Appendix G of the Bid Documents include a description and location of results found.

500.3.1 Inventory of Materials and Activities that May Pollute Storm Water

The following is a list of construction materials that will be used and activities that will be performed that will have the potential to contribute pollutants, other than sediment, to storm water runoff. Please consult the WPCDs for the location of BMPs where applicable:

- Vehicle Fluids, including oil, grease, petroleum and coolants associated with fueling and servicing vehicles and construction equipment
- Paints

- Portland Cement Concrete and Masonry products associated with demolition and construction activities
- Dirt from road excavation
- Landscaping products
- Soil stabilization products associated with landscaping and erosion control
- Portable Toilet Waste Products
- General Litter

The following construction activities have the potential to contribute sediment to storm water discharges:

- Clearing and grubbing
- Earthwork/excavation and grading
- Sheet pile driving
- Painting
- Soil and dirt haul
- Irrigation and landscaping operations
- Utility Removal and/or Construction

Section 500.5 lists all BMPs that are selected for this project. The location of BMPs are show in Attachment B, Water Pollution Control Drawings and the details are shown in Attachment O, BMP Details.

500.4 Water Pollution Control Drawings (WPCDs)

The Water Pollution Control Drawings provide the site layout, construction boundaries, limits of disturbance, drainage areas, and discharge and sampling points as applicable. The drawings note the position of temporary erosion, sediment, and run-on and run-off, control measures that can be found on the site. All zones for storage of materials, wastes, vehicles (including service & fueling), and construction access are also depicted on the site plans. The QSD is the only person authorized to amend or revise the WPCDs. The WPCDs can be found in Attachment B of the SWPPP.

500.5 Best Management Practices for Storm Water Management

The General Permit recognizes excess sediment from construction sites as the primary storm water pollutant. Excess sediment can cloud the water, which reduces the amount of sunlight reaching aquatic plants, clog fish gills, smother aquatic habitat and spawning areas, and impede navigation in our waterways. Sediment also transports other pollutants such as nutrients, metals, and oils and greases. The greatest impact on sediment release is the Grading and Land Development Phase, however great care and consideration shall be given to the remaining phases of construction activities for controlling pollution in storm water runoff. This SWPPP shall enlist a combination of Erosion, Sediment, and other storm water management measures to control sediment and their sources. The BMPs selected incorporate, at a minimum, the BMP requirements for Risk Level 2 projects. The referenced BMP specifications shall be implemented as stated.

500.5.1 Erosion Control

The purposes of erosion control measures are to retain soils in state and preclude sediment from washing away during rain events and becoming part of the storm water run-off. The increased run-off volume caused by the lack of adequate erosion control BMPs can overwhelm other BMPS and/or cause additional sediment to be release. So it is important to appropriately select the measure with support the site specific project features and terrain. The Permit requires effective soil cover for <u>all</u> areas deemed in-active (areas that are disturbed and not planned for construction activity for at least 14 days). Risk Level 1 (and greater) projects must also implement appropriate erosion control (in combination with sediment controls) for areas under active construction.

BMPs shall be in place prior to any grading and or/demolition. The graded slopes will be permanently stabilized with hydroseed or other BMP approved by the QSD. Great care will be used when applying and maintaining temporary or permanent erosion control. Temporary erosion control will be closely monitored for effectiveness and the SWPPP updated with any new BMPs if deemed necessary. The SWPPP will re-address erosion control measures as future construction commences. Plastic will be used for temporary erosion control/cover only if directed in a REAP by the QSP.

Implementation and locations of erosion control BMPs are shown on the Water Pollution Control Drawings (WPCDs) in Attachment B and/or described in this section. The BMP Consideration Checklist in Attachment C indicates the BMPs that will be implemented to control erosion on the construction site, and the details for each BMP are found in Attachment O; these are:

- EC-1, Scheduling
- EC-2, Preservation of Existing Vegetation
- EC-4, Hydroseeding
- EC-6, Straw Mulch
- EC-7, Geotextiles, Plastic
- EC-10, Velocity Dissipation Devices
- Ec-12, Streambank Stabilization

500.5.2 Wind Erosion Control

Great care must be taken to reduce the amount of fugitive dust from the project site. The airborne particulates settle on structures and roadways, collect on vegetation, and collect in drainage inlet. Much of the sediment during initial rains following periods of dry weather are caused by wind erosion and the fine nature of the material are difficult to treat in run-off.

To provide wind erosion control, existing vegetation will be preserved and maintained to the maximum extent practical, and only be disturbed when operations in that area commence. Tree removal will also be coordinated with the City of Palo Alto, Walter Passmore Urban Forest. The wind erosion control measures will be closely monitored for effectiveness and the SWPPP updated with any new BMPs if deemed necessary. The SWPPP will re-address wind erosion control measures as future construction commences.

The following BMPs have been selected to control dust from the construction site, and the details can be found in Attachment O:

- WE-1, Wind Erosion Control

500.5.3 Sediment Control

Sediment controls measure are designed and sited to limit the impact of sediment in storm water runoff. The measures must be located and sized to reduce the velocity of storm water and allow for settlement of particulates, and control intended to complement and enhance the selected erosion control measures and reduce sediment discharges from active construction areas. Poor implementation or design of sediment controls can contribute to increase sediment in rain events.

Risk Level 1 projects, at a minimum are required to implement proper perimeter controls. Linear barriers are required at toe, face of slope, and at grade breaks of exposed sloped and shall comply with the table below. The perimeter linear barriers should prove adequate in retaining much of the runoff at the point of origin. Inlet protection will be added, as necessary. These measures will be closely monitored for effectiveness and the SWPPP updated with any new BMPs if deemed necessary. The SWPPP will re-address sediment control measures as future construction commences.

Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet Flow Length
0-25%	20 Feet
25-50%	15 Feet
Over 50%	10 Feet

This project shall apply perimeter barriers consisting of silt fence and/or gravel bag barriers and as well as fiber roll and/or gravel bag barriers. Linear barriers on slopes and in open space areas will be applied per the criteria above as well as gravel bag energy dissipation devices (check dams, chevrons, etc.) in areas of concentrated flows will be provided. Also includes Inlet protection will be installed as necessary. These measures will be closely monitored for effectiveness and the SWPPP updated with any new BMPs if deemed necessary. The SWPPP will re-address sediment control measures as future construction commences.

The following BMPs are proposed to provide sediment control for this project are noted below and are shown on the Water Pollution Control Drawings (WPCDs) in Attachment B. The details for each BMP can be found in Attachment O.

- SE 1, Silt Fence
- SE-4, Check Dams
- SE-5, Fiber Rolls
- SE-6, Gravel Bag Berms
- SE-7, Street Sweeping and Vacuuming
- SE-10, Storm Drain Inlet Protection

Adequate quantities of materials will be maintained on-site throughout the duration of the project, to allow implementation of temporary sediment controls in the event of an unanticipated potential discharge of sediment from the site.

500.5.4 Tracking Control

The Permit requires that appropriate measures be implemented to prevent tracking of sediments onto paved roadways from disturbed areas of construction sites. Sediment releases caused by vehicles leaving the sites are difficult to control from entering drainage systems in a rain event as they are typically off-site. Any sediment will be removed prior to any rain event. During periods of activity on the site, all access points will be monitored daily to ensure no tracking of sediment or construction activity related materials are deposited.

This project shall implement and maintain specific construction Entrance and Exit controls and will employ measures to ensure proper use.

The following BMPs have been selected to reduce sediment tracking from the construction site onto private or public roads, and the details of each BMP are found in Attachment O:

- TC-1, Stabilized Construction Entrance/Exit
- SE-7, Street Sweeping and Vacuuming

500.5.5 Run-on and Runoff Controls

Run-on and runoff points must be effectively designed and well maintained. Run-on from offsite shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations the Permit. All BMPs to manage and control run-on and runoff shall be shown on the Water Pollution Control Drawings (WPCDs) in Attachment B.

Currently most of the run off sheet flows to existing natural swales. Minor disturbances in the existing landscape area shall be managed and monitored as part of the site's stormwater monitoring plan. Should that assessment change due to field observations or sampling data, the QSD shall prescribe additional BMP's via amendments.

500.6 Best Management Practices for Site Management

The project will execute good site management or "housekeeping" measures associated with construction materials and wastes; vehicle operation, storage and maintenance; landscape materials; and other potential pollutants associated with construction activity in accordance with Order 2012-0006-DWQ, Risk Level 2 requirements. Care will be taken to not only control the threat of pollutants from leaving the project in storm water runoff and non-storm water activities, but also from air deposition.

Prior to any material arriving to the project site, the QSP will meet with the Contractor to review the proposed materials to be used, and potential wastes and pollutant sources. The QSD will update/amend the SWPPP accordingly. The QSP shall review the appropriate measures for handling various materials and controlling construction wastes, including the timing of various BMPs.

500.6.1 Management of Construction Materials

Proper management and storage of construction materials is crucial to arresting the threat to water quality. All loose materials will be covered and bermed when not in use and prior to any precipitation. All chemical will be stored in appropriate containers with secondary containment to prevent spills or leaks. Additionally, proper measures to prevent tracking near drainage inlets or off-site.

The contractor shall keep a list all of the products to be used, and end products produced, that could potentially be a threat to water quality if discharged.

The following BMPs have been selected to manage construction materials on the site, and the details of these BMPs are found in Attachment O:

- WM-1, Material Delivery & Storage
- WM-2, Material use
- WM-3, Stockpile Management
- WM-4, Spill Prevention Control
- WM-5, Solid Waste Management
- WM-6, Hazardous Waste Management
- WM-7, Contaminated Soil Management
- WM-8, Concrete Waste Management
- WM-9, Sanitary/Septic Waste Management
- WM-10, Liquid Waste Management

500.6.2 Handling of Construction Wastes

Construction wastes are a common product of daily site operations. The objective in handling construction wastes is to prevent the release of such pollutants into drainage facilities and natural drainage courses, being tracked from the site or from becoming airborne. Rinse and wash waters cannot be disposed of on impervious, pervious, or in storm drain systems, disposal containers need to be covered daily and during rain events to prevent discharges into drainage systems, waste stockpiles need to be secured from rain or wind, and sanitation facilities must be sited properly and may require secondary containment. See section 500.3 for a list of pollutant sources and any additional BMPs. See the WPCDs for Waste Management BMPs where applicable.

The Contractor will provide equipment and material for clean-up of spills. The Contractor shall consult WM-4, Spill Prevention and Control for additional spill response. The Contractor shall provide adequately training personal and identify who is responsible for Spill Response.

Applications to reduce or eliminate pollution form wastes may include using safer alternative products, reducing exposure to hazardous materials, and proper training for the selection and deployment of appropriate BMPs.

These measures will begin once construction commences.

The following BMPs have been identified for the proper care and handling of construction wastes on the site (See Attachment O for details):

- WM-4, Spill Prevention & Control
- WM-5, Solid Waste Management
- WM-6, Hazardous Waste Management
- WM-7, Contaminated Soil Management
- WM-8, Concrete Waste Management
- WM-9, Sanitary Septic Waste Management
- WM-10, Liquid Waste Management

500.6.3 Vehicle Storage, Cleaning and Maintenance

Improper maintenance, cleaning fueling, etc. of vehicles and other equipment on the site can lead to serious storm water and non-storm water discharges. The preeminent strategy is handling these activities at offsite maintenance yards. If there is no other option, then designated area shall be established where storage, maintenance, fueling, and other activities can be controlled with appropriate BMPs.

All stored vehicles/equipment shall be in designated locations and shall have drip protection when not in use. All maintenance of vehicles shall be done offsite or at the staging area. Vehicle cleaning shall be done off-site. Fueling operations will be via licensed fuel truck with certified operators.

Consult the following BMPs (found in Attachment O) for procedure related to vehicle storage and maintenance to reduce or eliminate pollutants on the site:

- NS-8 Vehicle Equipment and Cleaning
- NS-9, Vehicle Equipment Fueling
- NS-10, Vehicle and Equipment Maintenance

500.6.4 Landscape Materials

The Permit specifically addresses the storage and application of landscaped materials. Landscape installation requires the handling of materials which contain nitrates and other pollutants which need to be controlled. Material stockpiles (mulches, topsoil, fertilizers, etc.) need to be contained when not actively being used and erodible materials need to be on pallets and covered when not being used or applied. Application of erodible landscape materials must follow the manufacturer's recommendations (or written specifications form experienced field personnel) and shall not be applied 2 days prior to any forecasted rain event.

Consult the Section 500.6.1 & 500.6.2 for material storage and use, and the proper handling of construction wastes associated with landscaping. Please also consult the following BMPs, found in Attachment O:

- WM-1, Material Delivery & Storage
- WM-2, Material use
- WM-3, Stockpile Management

500.7 Best Management Practices for Non-Storm Water Management

The project shall implement control measures to reduce or prevent the discharge of pollutants originating from a non-rain event. Discharges from improper management of construction activities are covered in Section 500.5, Best Management Practices for Site Management. Non-storm water events such as vehicle cleaning, improper street cleaning, water system maintenance, excessive irrigation for plan establishment, ground water discharges, etc. require specific handling to prevent discharges into natural drainage courses or storm drain inlets.

This project includes the demolition of existing structures and new road and landscaping improvements. Construction activities will include grading, paving, concrete placement utility construction, striping, and signing. Street sweeping & cleaning will be required periodically for existing paved areas; proper measures will be taken to prevent a non-storm event discharge. Dewatering of stormwater, will likely be necessary, and a dewatering and diversion plan has already been submitted to the RWQCB and incorporated into this plan. There will also be groundwater that may get mixed with stormwater that will require management. A separate Groundwater Management Plan is currently being developed and will be inserted into the SWPPP as an amendment.

The following BMPs have been selected to manage non-storm water pollution from leaving the site, and are found in Attachment O:

- NS-1, Water Conservation Practices
- NS-2, Dewatering Operations
- NS-3, Paving & Grinding Operations
- NS-5, Clear Water Diversion
- NS-6, Illicit Connection/Discharge
- NS-7, Potable Water Irrigation
- NS-8, Vehicle and Equipment Cleaning
- NS-9, Vehicle and Equipment Fueling
- NS-10, Vehicle and Equipment Maintenance
- NS-11, Pile Driving Operations
- NS-12, Concrete Curing
- NS-13, Concrete Finishing
- NS-15, Demolition Adjacent to Water

500.8 Construction BMP Maintenance, Inspection, and Repair

Frequent visual observation (inspections) will be provided to identify BMPs that require maintenance or repair to operate effectively. All inspections shall be performed by the Qualified SWPP Practitioner (QSP). The QSP may delegate any or all of these activities to an employee trained to do the task(s) appropriately, but shall ensure adequate deployment. Inspections will be conducted with the following frequency:

- Weekly.
- 24-hours prior to a forecasted rain event.

- At 24-hour intervals during extended rain events and within 48-hours after the end of said rain event.
- Waste receptacles & area streets will be inspected daily but those observations will not necessarily be recorded.

All inspections will identify and record BMPs (written and/or photographic evidence) that need maintenance, that has failed, or that could fail to operate as intended. Upon identifying failures or other shortcomings, as directed by the QSP, dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible. Design changes to the BMPs shall only be via amendment to this plan as approved and certified by the QSD.

The checklist, detailing the inspection requirements, is located in Attachment H. All inspections will be logged, and completed inspection checklists, along with photographs (if any) will also be located in Attachment H. All BMPs requiring maintenance will be tracked on the inspection forms, including photo documentation that BMPs are corrected. A program for maintenance, Inspection and Repair of BMPs is shown in Attachment G.

500.9 Rain Event Action Plan

REAPs will be prepared by the QSD when there is a forecasted storm event. A forecasted storm event is any weather pattern that is forecasted to have a 50 percent or greater probability of producing any precipitation at the project site location. The QSD will prepare the REAP for the forecasted storm event based on the current construction activity phase of the project. For REAPs, the construction activity phases are the Demolition Phase, Construction Phase, and Planting / Erosion Control Establishment Phase or Inactive Project Phase.

When the NWS forecast for 72 hours and greater predicts a forecasted storm event, the QSD will prepare a REAP using the REAP form appropriate to the current project stage. REAP forms are available in Appendix L. Prepared REAPs shall be submitted to the RE at least 48 hours prior to a forecasted storm event. If the NWS forecast changes and a storm event is forecasted to occur within 24-72 hours then a REAP must be prepared. If the NWS forecast changes and a storm event is forecasted to occur within the next 24 a REAP will not be prepared and the QSD will take immediate actions to ready the project site for the forecasted storm event.

The QSD shall implement a REAP within the 48 hours prior to the forecasted storm event. A copy of the REAP shall be provided to the RE at least 48 hours prior to the forecasted storm event. Copies of REAPs will be maintained in SWPPP File Category 20.45: Rain Event Action Plans in reverse chronologic order.

500.10 Post-Construction Storm Water Management

500.10.1 Post-Construction Control Practices

The proposed post-construction BMPs (or permanent measures) for the project will include landscaped areas, vegetated buffer zones, stabilized disturbed soil areas with permanent hydroseeding, outfalls with velocity dissipation devices, rock slope protection, and stabilized slopes. In accordance with Regional Water Quality Control Board Order No. R2-2015-0049C.3.b.ii(4)(d), for post construction requirements, the San Francisquito Creek Flood Reduction, Ecosystem Restoration and Recreation Project, San Francisco Bay to Highway 101, is specifically excluded from regulation because it is, "Impervious trails built to direct stormwater runoff to adjacent vegetated areas, or other non-erodible permeable areas, preferably away from creeks or towards the outboard side of levees."

500.10.2 Operation/Maintenance after Project Completion

The post-construction BMPs that are described above will be funded and maintained by the Owner of the project. The Owner (SFCJPA) will be responsible per O&M plan; each partner is responsible for trash removal. See draft Post Construction Stormwater Management Plan, May 2016.

500.11 Training

Section 300.5 shows the name of the Qualified SWPP Developer/Qualified SWPP Practitioner. All Credentials are located in Attachment I, and the credentials meet the contract requirements per Section 10.07.

Additional formal and informal training, provided through in field education for all subcontractors will be provided by the QSD. Additional, formal training may be deemed necessary and the sub-contractor will be provided information to on where to receive such training. The training log will show dates of informal training for various sub-contractor personnel and is located in Attachment I.

500.12 List of Subcontractors

A list of contractors will be maintained and included in the SWPPP. The Contractors and sub-contractors shall be notified and directed on compliance with the Permit and this SWPPP by the QSP. The list of contractors, with their address and telephone numbers, will be contained in Attachment J and will be updated as construction progresses.

Section 600 - Construction Site Monitoring Program

600.1 Objectives

This Construction Site Monitoring Program (CSMP) was developed, and will be implemented, to address the following objectives:

- To demonstrate that the site is in compliance with the Discharge Prohibitions;
- To determine whether non-visible pollutants are present at the construction site and are causing or contributing to Exceedance of water quality objectives;
- To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges; and
- To determine whether BMPs included in the SWPPP are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

The CSMP shall be implemented by the Qualified SWPP Practitioner. The name of the QSP for this project can be found in Section 300.5. The QSP shall provide all inspections, monitoring, and sampling. The QSP may delegate any or all of these activities to an employee trained to do the task(s) appropriately, but shall ensure adequate deployment. Visual observations will be conducted only during normal business hours. No inspections will be done during dangerous weather conditions (such as floods, electrical storms, etc.). Weather reports will be monitored daily and retained for the annual report.

600.2 Pre and Post Rain Events Inspections

Inspections (visual observations) will be provided within 2 days (48 hours) prior to a forecasted storm (at least 50% predicted precipitation by NOAA NWS). Inspections will also be provided within 48 hours after a storm has been determined to be a Qualifying Rain Event. A Qualifying Rain Event is a storm which produces ½" or more precipitation without a break of more than 48 hours. The purpose of the inspections will be to:

1) Identify any spills, leaks, or uncontrolled pollutant sources within storm water drainage areas that need corrective action;

2) Identify effective and ineffective BMPs and take corrective measures, and

3) Observe stored or contained water for potential discharge in a subsequent qualifying event.

For inspections related to items 1 and 3 above, care will be taken to observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, nutrients (algae blooms), turbidity, odors, and source(s) of any observed pollutants will be identified.

In cases where BMPs are inadequate or non-effective, additional BMPs will be identified and the SWPPP revised accordingly.

The QSP shall use the checklist, which details inspection requirements, located in Attachment H. All inspections will be logged, and completed inspection checklists, along with photographs (if any) will also be located in Attachment H.

600.3 Storm Water Effluent Monitoring (Sampling)

Risk Level 2 shall analyze their effluent discharges for both pH and Turbidity for qualifying storm events of a ½ inch or more without a break of more than 48 hours. Grab samples are also required from stored or contained storm water are from discharges subsequent to a qualifying rain event. A minimum of 3 samples are required per day of the qualifying event for every discharge point. In the event of a spill or BMP malfunction appropriate control and analysis measures will be taken and logged refer to section 600.4 for non-stormwater sampling.

Sampling Locations:

The Sampling locations shall characterize discharges associated with construction activity from the entire project disturbed area and located points where storm water is discharged off-site. Thirteen effluent sampling locations were identified for this project to be tested for turbidity and pH. Two sampling locations were identified for this project. Refer to the WPCDs in Attachment B for locations of sampling points. The table below lists the sampling points for this project. These points may be amended, removed, and added by the QSD via the SWPPP amendment process.

Unique Sampling Location Identifier	Location
SL01	Shown on WPCD-03
SL02	Shown on WPCD-04
SL03	Shown on WPCD-05
SL04	Shown on WPCD-05
SL05	Shown on WPCD-06
SL06	Shown on WPCD-06
SL07	Shown on WPCD-07
SL08	Shown on WPCD-08
SL09	Shown on WPCD-08
SL10	Shown on WPCD-08
SL11	Shown on WPCD-09
SL12	Shown on WPCD-09
SL13	Shown on WPCD-09
SL14	Shown on WPCD-09
SL15	Shown on WPCD-10

Monitoring Methods

The QSP shall conduct a field analysis of pH and Turbidity. The pH analysis will be provided by a portable calibrated pH meter or a pH test kit. The Turbidity analysis using a portable calibrated turbidity meter. The results will be recorded in the site log book in Nephelometric Turbidity Units (NTU). Table 600-1 outlines test methods, detection limits and reporting units for the required pH and Turbidity testing per Order 2012-0006-DWQ Risk Level 2 requirements.

The QSP shall ensure that storm water discharge collected and observed represent the effluent in each drainage area based on visual observation of the water and upstream conditions. Additionally, grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.

If a laboratory handles the testing of Turbidity, the QSP shall ensure that the samples will be received by the laboratory within 48 hours of each sampling day. Sample collection and handling procedures, sample analysis, and data management and evaluation, shall follow the process detailed in section 600.5. All laboratory analyses are conducted according to test procedures under 40 CFR Part 136, unless other test procedures have been specified in this General Permit or by the Regional Water Quality Control Board The laboratory must be certified by the State Department of Health Services. Field personnel who collect, maintain, and ship samples in accordance with the Surface Water Ambient Monitoring Program's (SWAMP) 2008 Quality Assurance Program Plan (QAPrP).

Table 600-1
Test Methods, Detection Limits, Reporting Units and Applicable NALs

Pollutant Source	Testing Parameters	Testing Method	Detection Limits	Min. Detection Limit	Performance Target Limit
Concrete Wastes	pH (STD)	Calibrated Field Instrument EPA 9040	1-14	0.2 pH	Lower NAL = 6.5 Upper NAL = 8.5
Sediments, Litter, Wastes, Scrap, Trash, Debris	Turbidity	Calibrated Field Instrument Per Manufacturer Instructions	Per Calibrated Field Instrument	1 NTU	NAL - 250 NTU

Reporting

The QSP shall be prepared to collect samples and conduct visual observation (inspections) until the minimum requirements are completed. The QSP shall also monitor and report site run-on from surrounding areas if there is reason to believe run-on may contribute to an exceedance of NALs. The QSP will use the Field Sampling Log provided in Attachment P. A record of sampling results and visual observations for qualifying events will also be located in Attachment P.

Samples, although collected, will only be recorded and reported, should the event be determined to be a qualifying rain event per both the NOAA local rain gauge & the on-site rain gauge. Once activities, which are considered to be a high risk for pH commence, pH sampling will be required.

NAL Exceedance Report

In the event that any effluent sample exceeds an applicable NAL, Risk Level 2 dischargers shall electronically submit all storm event sampling results to the State Water Board no later than 10 days after the conclusion of the storm event. The Regional Boards have the authority to require the submittal of an NAL Exceedance Report.

Each NAL Exceedance Report shall be certified by the LRP in accordance with the Special Provisions for Construction Activity and shall retain an electronic or paper copy of each NAL Exceedance Report for a minimum of three years after the date the annual report is filed. See sample NAL Exceedance Report in Attachment T.

Sample Collection Exemptions

The QSP or QSP trained personnel is not required to physically collect samples or conduct visual observation (inspections) under the following conditions:

1) During dangerous weather conditions such as flooding and electrical storms.
2) Outside of normal site business hours as defined in Section 600.1.

If no required samples or visual observation (inspections) are collected due to these exceptions, an explanation in the SWPPP and in the Annual Report documenting why the sampling or visual observation (inspections) were not conducted is required.

Quality Control

All testing shall be conducted by the QSP, or by trained personnel who are supervised by the QSP. These personnel will be trained on both Order 2012-0006-DWQ sampling collection requirements and the specific sampling equipment operation requirements. The specific calibration requirements and collection techniques shall be per the manufacturer's recommendations for the specific sampling instruments employed. All sampling instruments shall meet the minimum requirements per Order 2012-0006-DWQ for accuracy.

In general, calibration for the pH meter will be conducted before every monitoring day. A two point calibration will be provided for turbidity meters or per manufacturer's instructions. Record of the calibration for each meter will be noted on the sampling log.

If possible the pH sampling will be provided within natural flow. If a sampling bucket is required it shall be plastic and clean. Both the bucket and stream flow must be deep enough to full immerse the probe. Care shall be taken with the bucket as it must be brought to the same temperature as the water and kept out of direct sunlight and wind. The probe must equilibrate at least one minute before recording the result. It must be to the nearest 0.1 pH unit.

Turbidity samples should represent the sampled water mass. It is good to take several measurements during each sampling event. Great care shall be taken to ensure the vials are clean and free of scratches, moisture, lint, fingerprints, etc. The sample should not have any floating gas bubble. A recalibration may be necessary if sample readings are outside stand limits.
(3)

All logs will be reviewed by the QSD after each event for completeness and appropriateness of the recordings. The visual observations shall also be reviewed for comparison to readings.

600.4 Non-Stormwater Discharge Monitoring

Non-storm water management BMPs include procedures and practices designed to minimize or eliminate the discharge of pollutants from vehicle and equipment cleaning, fueling, and maintenance operations, but also protect for discharges associated with street cleaning, and even irrigation of vegetative erosion control. The monitoring program is designed to inspect non-storm water measures to prevent discharges into surface waters or MS4 drainage systems.

Visual observations (inspections) for non-storm water will be performed quarterly in between January- March, April –June, July-September, and October -December of each year. The Inspections will involve each drainage area for the presence of (or indications of prior) unauthorized and authorized non-storm water discharges and their sources.

Inspections will document the presence or evidence of any non-storm water discharge (authorized or unauthorized), pollutant characteristics (floating and suspended material, sheen, discoloration, nutrients, turbidity, odor, etc.), and their source(s).

The QSP shall use the checklist, which details inspection requirements, located in Attachment H. All inspections will be logged, and completed inspection checklists, along with photographs (if any) will also be located in Attachment H.

<u>Effluent Sampling</u>

Once the construction commences the QSP shall direct the sampling effluent at all discharge points where non-storm water and/or authorized non-storm water is discharged off-site. Sample collection and handling procedures, sample analysis, and data management and evaluation, shall follow the process detailed in section 600.5. The laboratory SGS Accutest West Coast Laboratory at 2105 Lundy Ave, San Jose, CA 95131, is certified by the State Department of Health Services.

600.5 Non-Visible Pollutants Monitoring

The Monitoring for Non-Visible Pollutants will involve collection one or more samples during any breach, malfunction, leakage, or spill observed during an inspection which could result in the discharge of pollutants to surface waters that would not be visually detectable in storm water. The sampling and analysis for non-visible pollutants will be in accordance with the requirements specified in the Permit.

600.5.1 Scope of Monitoring Activities

Construction Wastes as identified in Section 500.3 shall be tested when suspected per Table 600-1. Should additional lab analysis be required based on the nature and suspected source of the contamination, the lab shall consult Attachment Q for detailed testing information.

Per the inquiry discussed in Section 500.3, there are no existing site features that are potential sources of non-visible pollutants to storm water discharges from the project.

The project does not anticipate the use of soil amendments at this time, and therefore they are not considered a potential source of non-visible pollutants. Should the project employ soil amendments, this section will be amended.

The project has the potential to receive storm water run-on with the potential to contribute non-visible pollutants to storm water discharges from the project. Locations of such run-on to the project site are shown on the WPCDs in Attachment B. Refer to Attachment Q for detailed testing information.

Sampling for non-visible pollutants will be conducted when (1) a breach, leakage, malfunction, or spill is observed; and (2) the leak or spill has not been cleaned up prior to the rain event; and (3) there is the potential for discharge of non-visible pollutants to surface waters or drainage system.

600.5.2 Monitoring Strategy

<u>Sampling Schedule</u>

Samples for the applicable non-visible pollutant(s) and a sufficiently large uncontaminated background sample shall be collected during the first two hours of discharge from rain events that result in a sufficient discharge for sample collection. Samples shall be collected during normal business hours (as defined in section 600.1) and shall be collected regardless of the time of year, status of the construction site, or day of the week.

In conformance with SWRCB Order 2012-0006-DWQ definition, a minimum of 48 hours of dry weather will be used to distinguish between separate rain events.

Collection of discharge samples for non-visible pollutant monitoring will be triggered when any of the following conditions are observed during the required inspections conducted before or during rain events:

- Materials or wastes containing potential non-visible pollutants are not stored under watertight conditions. Watertight conditions are defined as (1) storage in a watertight container, (2) storage under a watertight roof or within a building, or (3) protected by temporary cover and containment that prevents storm water contact and runoff from the storage area.
- Materials or wastes containing potential non-visible pollutants are stored under watertight conditions, but (1) a breach, malfunction, leakage, or spill is observed; (2) the leak or spill is not cleaned up prior to the rain event, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm sewer system.
- An operational activity, including but not limited to those in Section 600.5.5, with the potential to contribute non-visible pollutants (1) was occurring during or within 24 hours prior to the rain event, (2) applicable BMPs were observed to be breached, malfunctioning, or improperly implemented, and (3) there is the potential for discharge of non-visible pollutants to surface waters or a storm sewer system.
- Soil amendments that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil have been applied, and there is the potential for discharge of non-visible pollutants to surface waters or a storm sewer system.
- Storm water runoff from an area contaminated by historical usage of the site has been observed to combine with storm water runoff from the site, and there is the potential for discharge of non-visible pollutants to surface waters or a storm sewer system.

<u>Sampling Locations</u>

Sampling locations are based on proximity to planned non-visible pollutant storage, occurrence or use; accessibility for sampling, personnel safety; and other factors in accordance with the applicable requirements in the Permit. Planned sampling locations are show on the WPCDs in Attachment B and include the following:

- At this time, 0 sampling locations have been identified for the collection of samples of runoff that drain areas where soil amendments that have the potential to change the chemical properties, engineering properties, or erosion resistance of the soil will be applied.
- Zero sampling locations have been identified for the collection of samples of runoff that drain areas contaminated by historical usage of the site.
- Three sampling locations have been identified for the collection of samples of run-on to the project site with the potential to combine with discharges being sampled for non-visible pollutants. These samples are intended to identify sources of potential non-visible pollutants that originate off the project site.
- All sample locations are identified on the WPCDs in Attachment B.

If an operational activity or storm water inspection conducted 24 hours prior to or during a rain event identifies the presence of a material storage, waste storage, or operations area with spills or the potential for the discharge of non-visible pollutants to surface waters or a storm water sewer system that was an unplanned location and has not been identified on the WPCDs, sampling locations will be selected using the same rationale as that used to identify planned locations.

600.5.3 Monitoring Preparation

The QSP shall constantly maintain an adequate stock of monitoring supplies and equipment for monitoring non-visible pollutants will be available on the project site prior to a sampling event. Monitoring supplies and equipment will be stored in a cool-temperature environment that will not come into contact with rain or direct sunlight. Sampling personnel will be available to collect samples in accordance with the sampling schedule.

Supplies maintained at the project site will include, but will not be limited to, surgical gloves, sample collection equipment, coolers, appropriate number and volume of sample bottles, identification labels, re-sealable storage bags, paper towels, personal rain gear, ice, Sampling Activity Log forms, and Chain of Custody (COC) forms. The Contractor will obtain and maintain the field-testing instruments, as identified in Section 600.5.6, for analyzing samples in the field by Contractor sampling personnel.

600.5.4 Analytical Constituents

Identification of Non-Visible Pollutants

Attachment Q lists the specific sources and types of potential non-visible pollutants on the project site and the applicable water quality indicator constituent(s) for that pollutant.

600.5.5 Sample Collection and Handling

Sample Collection Procedures

Samples of discharge will be collected at the designated sampling locations shown on the WPCDs for observed breaches, malfunctions, leakages, spills, operational areas, soil amendment application areas, and historical site usage areas that triggered the sampling event.

Grab samples will be collected and preserved in accordance with the methods identified in the Table 600-1. Only personnel trained in proper water quality sampling will collect samples, and all samples will be overseen by the QSP.

Samples will be collected by placing a separate lab-provided sample container directly into a stream of water down gradient and within close proximity to the potential non-visible pollutant discharge location. This separate lab-provided sample container will be used to collect water, which will be transferred to sample bottles for laboratory analysis. The up gradient and uncontaminated background samples shall be collected first prior to collecting the down gradient to minimize cross-contamination. The sampling personnel will collect the water up gradient of where they are standing. Once the separate lab-provided sample container is filled, the water sample will be poured directly into sample bottle provided by the laboratory for the constituent(s) being monitored.

To maintain sample integrity and prevent cross-contamination, sampling collection personnel will:

- Wear a clean pair of surgical gloves prior to the collection and handling of each sample at each location.
- Not contaminate the inside of the sample bottle by not allowing it to come into contact with any material other than the water sample.

- Discard sample bottles or sample lids that have been dropped onto the ground prior to sample collection.
- Not leave the cooler lid open for an extended period of time once samples are placed inside.
- Not sample near a running vehicle where exhaust fumes may impact the sample.
- Not touch the exposed end of a sampling tube, if applicable.
- Avoid allowing rainwater to drip from rain gear or other surfaces into sample bottles.
- Not eat, smoke, or drink during sample collection.
- Not sneeze or cough in the direction of an open sample bottle.
- Minimize the exposure of the samples to direct sunlight, as sunlight may cause biochemical transformation of the sample to take place.
- Decontaminate sampling equipment prior to sample collection using a TSP-soapy water wash, distilled water rinse, and final rinse with distilled water.

Dispose of decontaminated water/soaps appropriately; i.e., not discharge to the storm drain system or receiving water.

Sample Handling Procedures

Immediately following collection, sample bottles for laboratory analytical testing will be capped, labeled, documented on a Chain of Custody (COC) form provided by the analytical laboratory, sealed in a re-sealable plastic storage bag, placed in an ice chilled cooler, at as near to 4 degrees Celsius as practicable, and delivered within 24 hours to the following California state-certified laboratory:

Laboratory Name:	SGS Accutest West Coast Laboratory
Address:	2105 Lundy Avenue
	San Jose, CA 95131
Telephone Number:	(408) 588-0200
Point of Contact:	N/A

Sample Documentation Procedures

All original data documented on sample bottle identification labels, Chain of Custody forms, Sampling Activity Logs, and Inspection Checklists will be recorded using waterproof ink. These will be considered accountable documents. If an error is made on an accountability document, the individual will make corrections by lining through the error and entering the correct information. The erroneous information will not be obliterated. All corrections will be initialed and dated. Copies of the Sampling Activity Log and Chain of Custody form are provided in Attachment P.

Sampling and field analysis activities will be documented using the following:

- Sample Bottle Identification Labels: Sampling personnel will attach an identification label to each sample bottle. At a minimum, the following information will be recorded on the label, as appropriate:
  - Project Name, Project Number
  - Unique Sample identification number and location
    [Project Number]-[Six digit sample collection date]-[Location]
    (*Example*: 0G5304-081801-Inlet472).
    Quality assurance/quality control (QA/QC) samples shall be identified similarly using a unique sample number or designation
    (*Example*: 0G5304-081801-DUP1)
  - Collection date/time (No time applied to QA/QC samples)
  - Analysis constituent
- Sampling Activity Logs: A log of sampling events will identify:
  - Sampling Date
  - Separate times for collected samples and QA/QC samples recorded to the nearest minute
  - Unique Sample identification number and location
  - Analysis constituent
  - Names of sampling personnel
  - Weather conditions (including precipitation amount)
  - Field analysis results
  - Other pertinent data
- Chain of Custody (COC) forms: All samples to be analyzed by a laboratory will be accompanied by a COC form provided by the laboratory. Only the sample collectors will sign the COC form over to the lab. COC procedures will be strictly adhered to for QA/QC purposes.

- Storm Water Quality Construction Inspection Checklists: When applicable, the Contractor's storm water inspector will document on the checklist that samples for non-visible pollutants were taken during the rain event.

600.5.6 Sample Analysis

Samples will be analyzed for the applicable constituents using the analytical methods identified in Attachment Q.

600.5.7 Quality Assurance/Quality Control

For an initial verification of laboratory or field analysis, duplicate samples will be collected at a rate of 10 percent or 1 duplicate per sampling event. The duplicate sample will be collected, handled, and analyzed using the same protocols as primary samples. A duplicate sample will be collected at each location immediately after the primary sample has been collected. Duplicate samples will be collected where contamination is likely, not on the background sample. Duplicate samples will not influence any evaluations or conclusions; however, they will be used as a check on laboratory quality assurance.

600.5.8 Data Management and Reporting

A copy of all water quality analytical results and QA/QC data will be included in the on-site SWPPP within 5 days of sampling (for field analyses) and within 30 days (for laboratory analyses).

Lab reports and COCs will be reviewed by both the QSD and the LRP (or their representative) for consistency between lab methods, sample identification, dates, and times for both primary samples and QA/QC samples. All data, including COC forms and Sampling Activity Logs, shall be kept with the SWPPP.

600.5.9 Data Evaluation

An evaluation of the water quality sample analytical results, including figures with sample locations, the water quality analytical results, and the QA/QC data, will be included in the on-site SWPPP.

Should the runoff/down gradient sample show an increased level of the tested constituents relative to the background sample, the BMPs, site conditions, and surrounding influences will be assessed to determine the probable cause for the increase. As determined by the site data and evaluation, appropriate BMPs will be required or modified to mitigate discharges of non-visual pollutant concentrations. Any revisions to the BMPs will be recorded as an amendment to the SWPPP.

600.5.10 Change of Conditions

Whenever SWPPP monitoring, pursuant to the General Permit, indicates a change in site conditions that might affect the appropriateness of sampling locations or introduce additional non-visible pollutants of concern, testing protocols will be revised accordingly. All revisions shall be made by the QSD only.
All such revisions will be recorded as amendments to the SWPPP.

600.6 Record Keeping and Reports

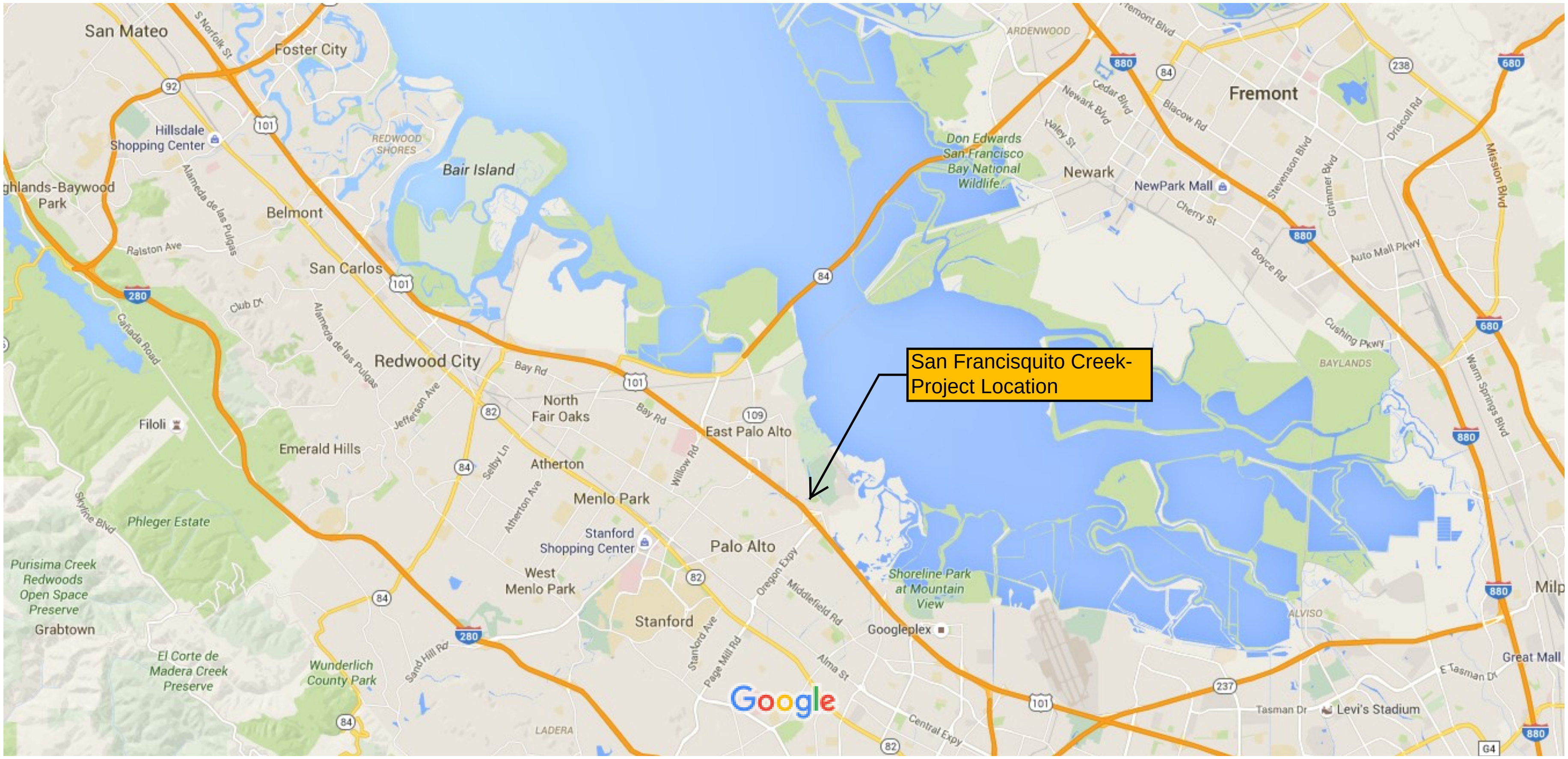
Records shall be retained for a minimum of three years for the following items:

- Site inspections
- BMP Correction Records
- Weather records
- Rain Event Action Plans
- Annual Reports
- Sampling Logs
- Non-visual sampling results
- Approved SWPPP document and amendments

Attachment A

Vicinity Map

VICINITY MAP



N

SITE MAP

GENERAL SITE PLAN

SCALE: 1"=200'

KEY NOTE:

(1) CONTRACTOR TO INSTALL PROJECT SIGNS PROVIDED BY SCVWD.

REV	DESCRIPTION	DATE	APPR.

HDR

DATE	JULY 2015
DESIGN	L. JONES
DRAWN	H. SUAREZ
CHECKED	P. HRADILEK

ENGINEERING CERTIFICATION

REGISTERED PROFESSIONAL ENGINEER LANCE M. JONES 68374 Exp. CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

GENERAL SITE PLAN

SCALE: 1" = 200'

VERIFY SCALES: 0 1"

BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

PROJECT NUMBER: 26284002

SHEET CODE: G-3

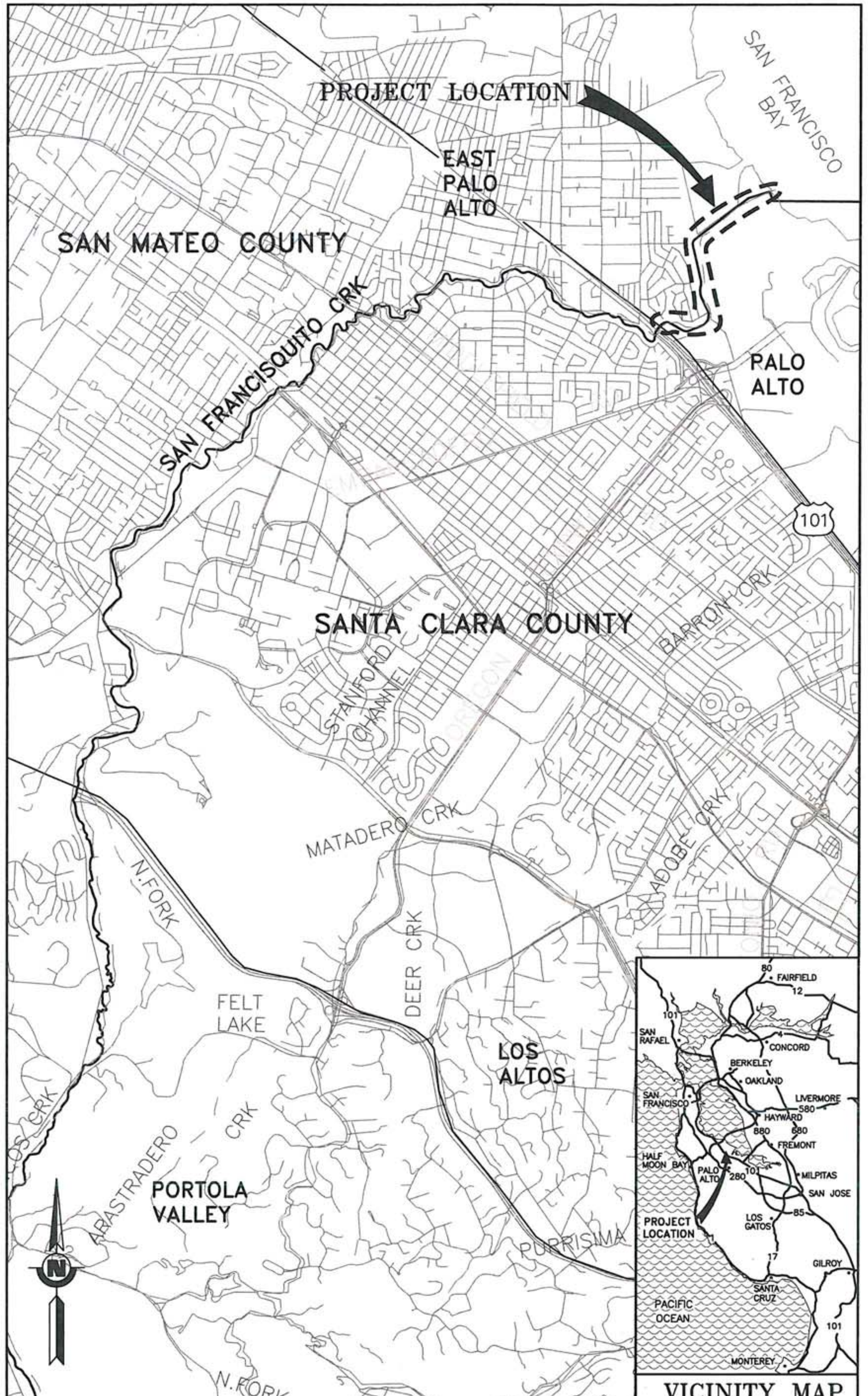
SHEET NUMBER: 3 OF 126

DOCUMENT NUMBER: SFC_LP-G-1028-XXXXXXX

USERNAME: BillShod Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\G-03

Attachment B

Water Pollution Control Drawings (WPCDs)



LOCATION MAP
SCALE: 1"=2,500'

MAP AND CONSTRUCTION PLAN

FOR

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, AND RECREATION PROJECT

SAN FRANCISCO BAY TO HIGHWAY 101
CONTRACT NO. C0613

Water Pollution Control Drawings

Santa Clara Valley Water District

APPROVED BY:

Saeid Hosseini 2/23/16

SAEID HOSSEINI, P.E. DATE
ENGINEERING UNIT MANAGER
DESIGN AND CONSTRUCTION UNIT 1
SANTA CLARA VALLEY WATER DISTRICT

ACCEPTED BY:

Melanie Richardson 2-23-16

MELANIE RICHARDSON, P.E. DATE
DEPUTY OPERATING OFFICER
WATERSHEDS DESIGN AND CONSTRUCTION DIVISION
SANTA CLARA VALLEY WATER DISTRICT

Len Materman 2/23/16

LEN MATERMAN DATE
EXECUTIVE DIRECTOR
SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

PREPARED BY:

HDR

SERGIO JIMENEZ, P.E. DATE
WATER RESOURCES MANAGEMENT SECTOR MANAGER

WATER POLLUTION CONTROL GENERAL NOTES
1. Water Pollution Control Drawings will be amended to reflect existing conditions and anticipate contractor operations based upon routine inspections made by the Water Pollution Control Manager.
2. Sampling locations will be field verified via inspections by the Water Pollution Control Manager and revised in the plans accordingly.
3. Perimeter control BMPs will be deployed to protect Disturbed Soil Areas (DSA) prior to commencement of any ground disturbing activities.
4. Permanent erosion control shall be installed as areas are determined to be complete. Refer to the irrigation plan sheets for permanent erosion control, and note that the hydroseeded areas shown on the WPCDs are in accordance with the irrigation plan sheets.
5. All storm drain inlets receiving runoff from disturbed soil area shall be protected with storm drain inlet protection measures.
6. Road tracking will be swept at the end of day.
7. The Diversion plan as included in Addendum 5, has been incorporated into the WPCDs. Please note that the Diversion Plan is still being approved. Text boxes with a light blue background denote items from the Diversion Plan.
8. Best Management Practices shall not contain any monofilament netting which could potentially trap wildlife.
9. See additional notes on WPCD-13.

USERNAME: HSUAREZ Thu 18 Feb 2016 07:32pm
FILENAME: C:\pwworking\sac\d0171341\G-01

DOCUMENT NUMBER: SFC_LP-G-1028-XXXXXXX

WPCD-01

EXISTING UTILITIES SHEET LAYOUT PLAN

SCALE: 1"=200'

REV	DESCRIPTION	DATE	APPR.

HDR

DATE: JULY 2015
DESIGN: L. JONES
DRAWN: H. SUAREZ
CHECKED: P. HRADILEK

ENGINEERING CERTIFICATION

PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

UTILITY SHEET LAYOUT PLAN OVERALL LAYOUT

WPCD-02

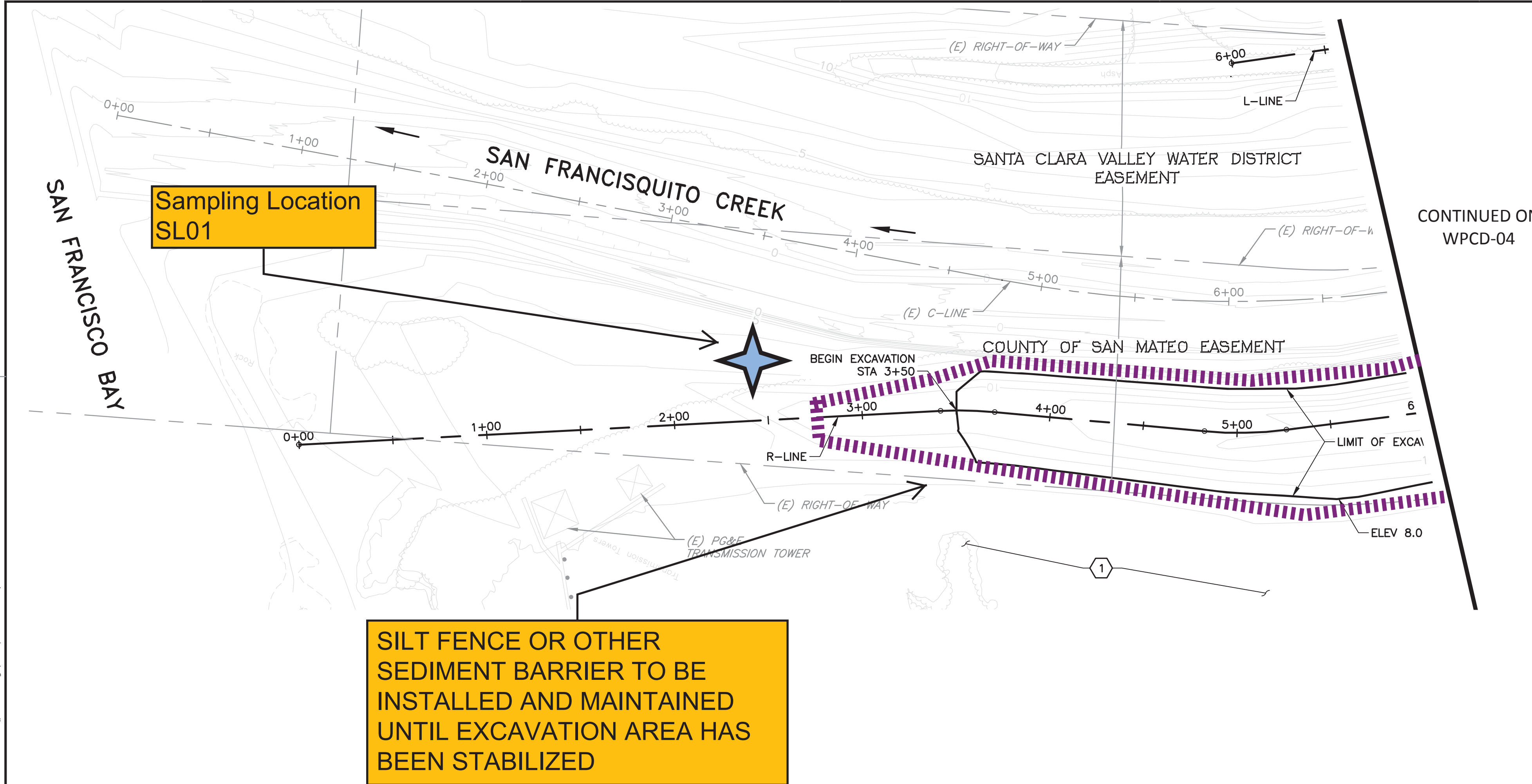
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHEET CODE: C-40

SHEET NUMBER: 55 OF 126

DOCUMENT NUMBER: SFC_LP-G-1028-XXXXXXX

USERNAME: BillShod Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\C-40



CONTINUED ON WPCD-04

KEY NOTE:

1. EXISTING TIDAL MARSH AREA, DO NOT DISTURB.

LEGEND

- FLOW ARROW
- DI PROTECTION
- SAMPLING LOCATION
- SILT FENCE
- STABILIZED CONSTRUCTION ENTRANCE/EXIT
- AREA TO BE HYDROSEEDED
- NOTE ASSOCIATED WITH DIVERSION PLAN
- BAKER TANK
- COFFERDAM
- ENERGY DISSIPATOR DEVICE
- PUMP STATION
- SETTLEMENT TANK
- DIVERSION ROUTE

VERT: 1"=4'

REV	DESCRIPTION	DATE	APPR.

DATE: JULY 2015
DESIGN: L. JONES
DRAWN: H. SUAREZ
CHECKED: B. JOHNSON

ENGINEERING CERTIFICATION
PROJECT ENGINEER DATE

HDR

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY
ACCEPTED BY DISTRICT
PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

PLAN AND PROFILE – (R-LINE) STATION 0+00 TO 8+00

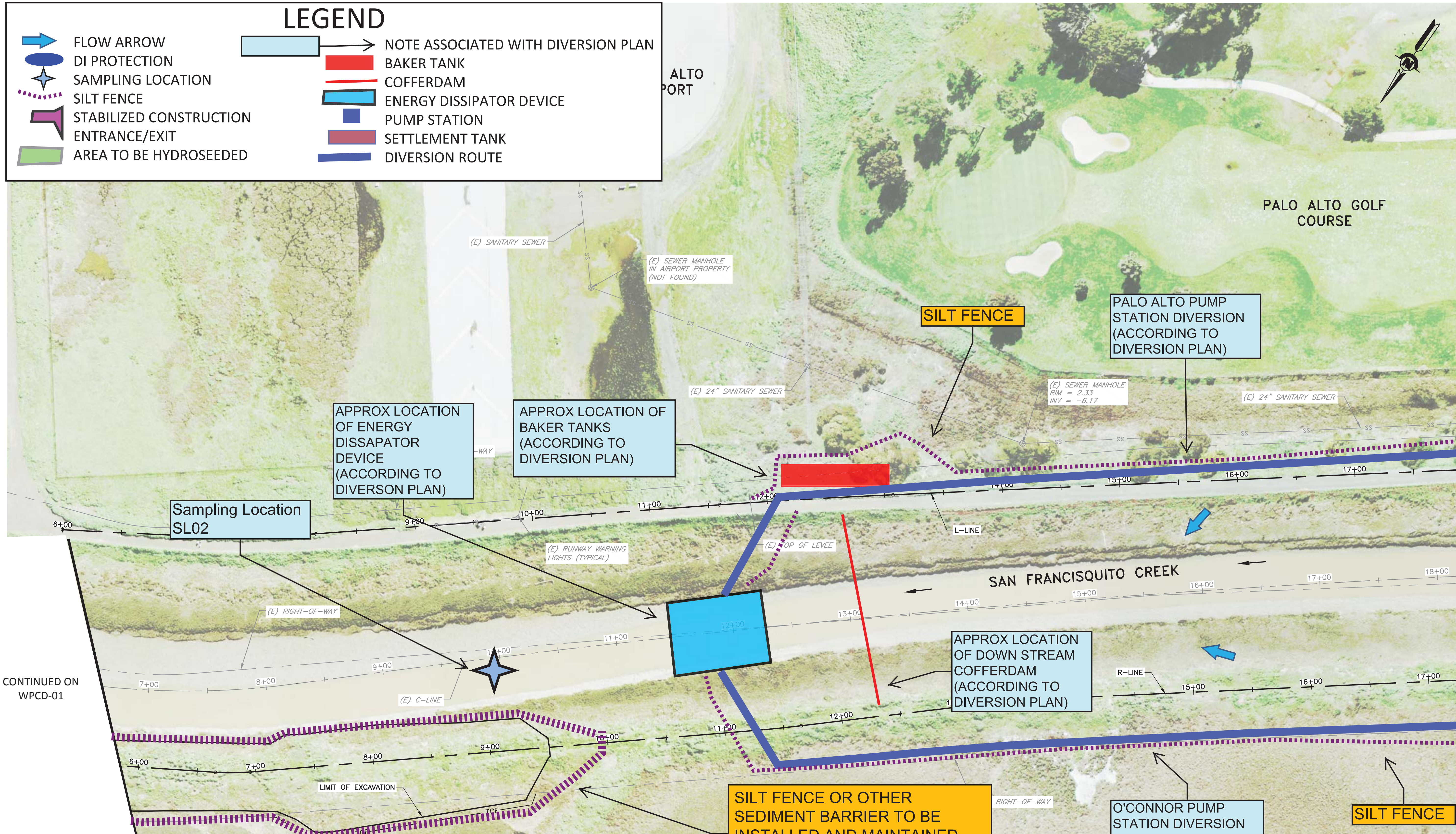
WPCD-03

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHEET CODE: C-1
SHEET NUMBER: 16 OF 126

DOCUMENT NUMBER:SFC_LP-C-1028-XXXXXXX

USERNAME: BillShod Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\C-01



PLAN

SCALE: 1"=

REV	DESCRIPTION	DATE	APPR.

HDR

DATE: JULY 2015
DESIGN: L. JONES
DRAWN: H. SUAREZ
CHECKED: P. HRADILEK

ENGINEERING CERTIFICATION
REGISTERED PROFESSIONAL ENGINEER LANCE M. JONES 68374 Exp. 9/30/17 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

UTILITY PLAN
STA 6+00 TO STA 18+00 (C-LINE)

WPCD-04

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHEET CODE: C-41

SHEET NUMBER: 56 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXX

NOTE:

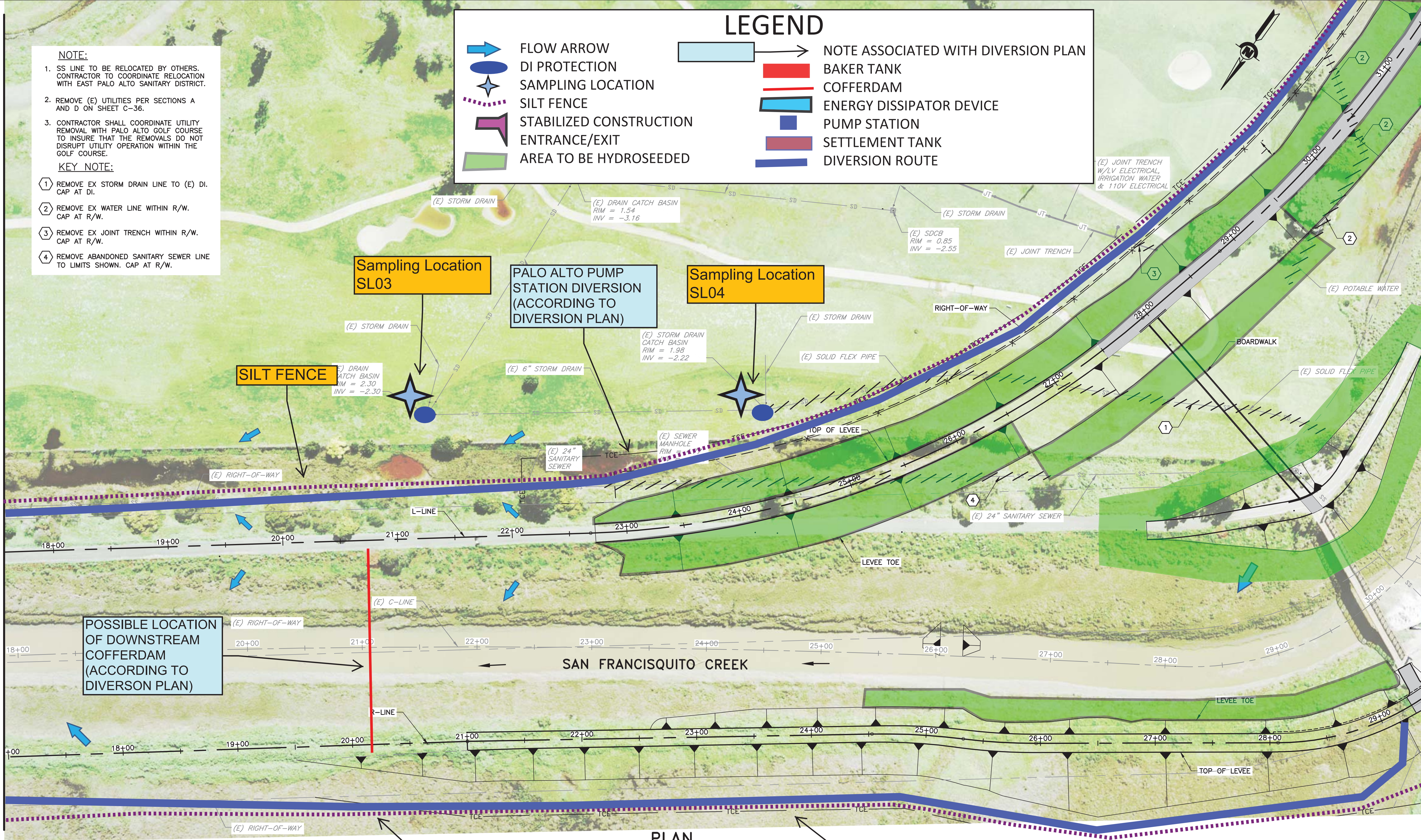
1. SS LINE TO BE RELOCATED BY OTHERS. CONTRACTOR TO COORDINATE RELOCATION WITH EAST PALO ALTO SANITARY DISTRICT.
2. REMOVE (E) UTILITIES PER SECTIONS A AND D ON SHEET C-36.
3. CONTRACTOR SHALL COORDINATE UTILITY REMOVAL WITH PALO ALTO GOLF COURSE TO INSURE THAT THE REMOVALS DO NOT DISRUPT UTILITY OPERATION WITHIN THE GOLF COURSE.

KEY NOTE:

1. REMOVE EX STORM DRAIN LINE TO (E) DI. CAP AT DI.
2. REMOVE EX WATER LINE WITHIN R/W. CAP AT R/W.
3. REMOVE EX JOINT TRENCH WITHIN R/W. CAP AT R/W.
4. REMOVE ABANDONED SANITARY SEWER LINE TO LIMITS SHOWN. CAP AT R/W.

LEGEND

- FLOW ARROW
- DI PROTECTION
- SAMPLING LOCATION
- SILT FENCE
- STABILIZED CONSTRUCTION ENTRANCE/EXIT
- AREA TO BE HYDROSEEDED
- NOTE ASSOCIATED WITH DIVERSION PLAN
- BAKER TANK
- COFFERDAM
- ENERGY DISSIPATOR DEVICE
- PUMP STATION
- SETTLEMENT TANK
- DIVERSION ROUTE



PLAN

SCALE: 1"=40'

SILT FENCE

REV	DESCRIPTION	DATE	APPR.

DATE: JULY 2015
DESIGN: L. JONES
DRAWN: H. SUAREZ
CHECKED: P. HRADILEK

ENGINEERING CERTIFICATION

REGISTERED PROFESSIONAL ENGINEER LANCE M. JONES 68374 Exp. 3/31/17 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

UTILITY PLAN

STA 18+00 TO STA 31+00 (C-LINE)

WPCD-05

VERIFY SCALES: BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHEET CODE: C-42

SHEET NUMBER: 57 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXX

USERNAME: BillShod Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\C-42

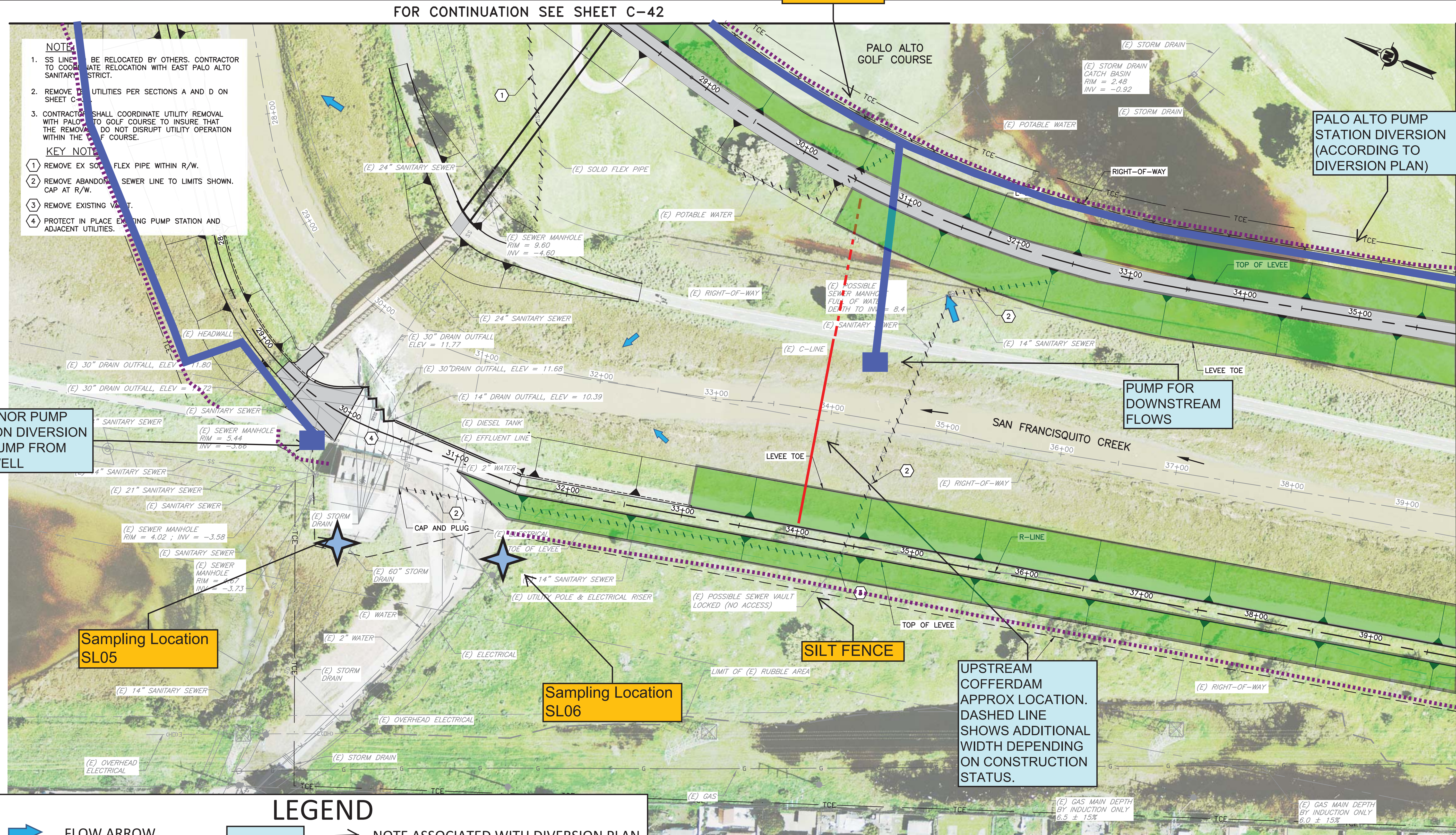
FOR CONTINUATION SEE SHEET C-42

NOTE

1. SS LINE ... BE RELOCATED BY OTHERS. CONTRACTOR TO COORD...NATE RELOCATION WITH EAST PALO ALTO SANITARY ...STRICT.
2. REMOVE ... UTILITIES PER SECTIONS A AND D ON SHEET C-...
3. CONTRACTOR SHALL COORDINATE UTILITY REMOVAL WITH PALO ...TO GOLF COURSE TO INSURE THAT THE REMOVA... DO NOT DISRUPT UTILITY OPERATION WITHIN THE ...F COURSE.

KEY NOTE

1. REMOVE EX SO... FLEX PIPE WITHIN R/W.
2. REMOVE ABANDON... SEWER LINE TO LIMITS SHOWN. CAP AT R/W.
3. REMOVE EXISTING VA...T.
4. PROTECT IN PLACE EX...ING PUMP STATION AND ADJACENT UTILITIES.



FOR CONTINUATION SEE SHEET C-44

LEGEND

FLOW ARROW	NOTE ASSOCIATED WITH DIVERSION PLAN
DI PROTECTION	BAKER TANK
SAMPLING LOCATION	COFFERDAM
SILT FENCE	ENERGY DISSIPATOR DEVICE
STABILIZED CONSTRUCTION ENTRANCE/EXIT	PUMP STATION
AREA TO BE HYDROSEEDED	SETTLEMENT TANK
	DIVERSION ROUTE

PLAN

SCALE: 1"=40'

CERTIFICATION

P. HRADILEK | PROJECT ENGINEER | DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER | DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

UTILITY PLAN

STA 30+00 TO STA 39+00 (C-LINE)

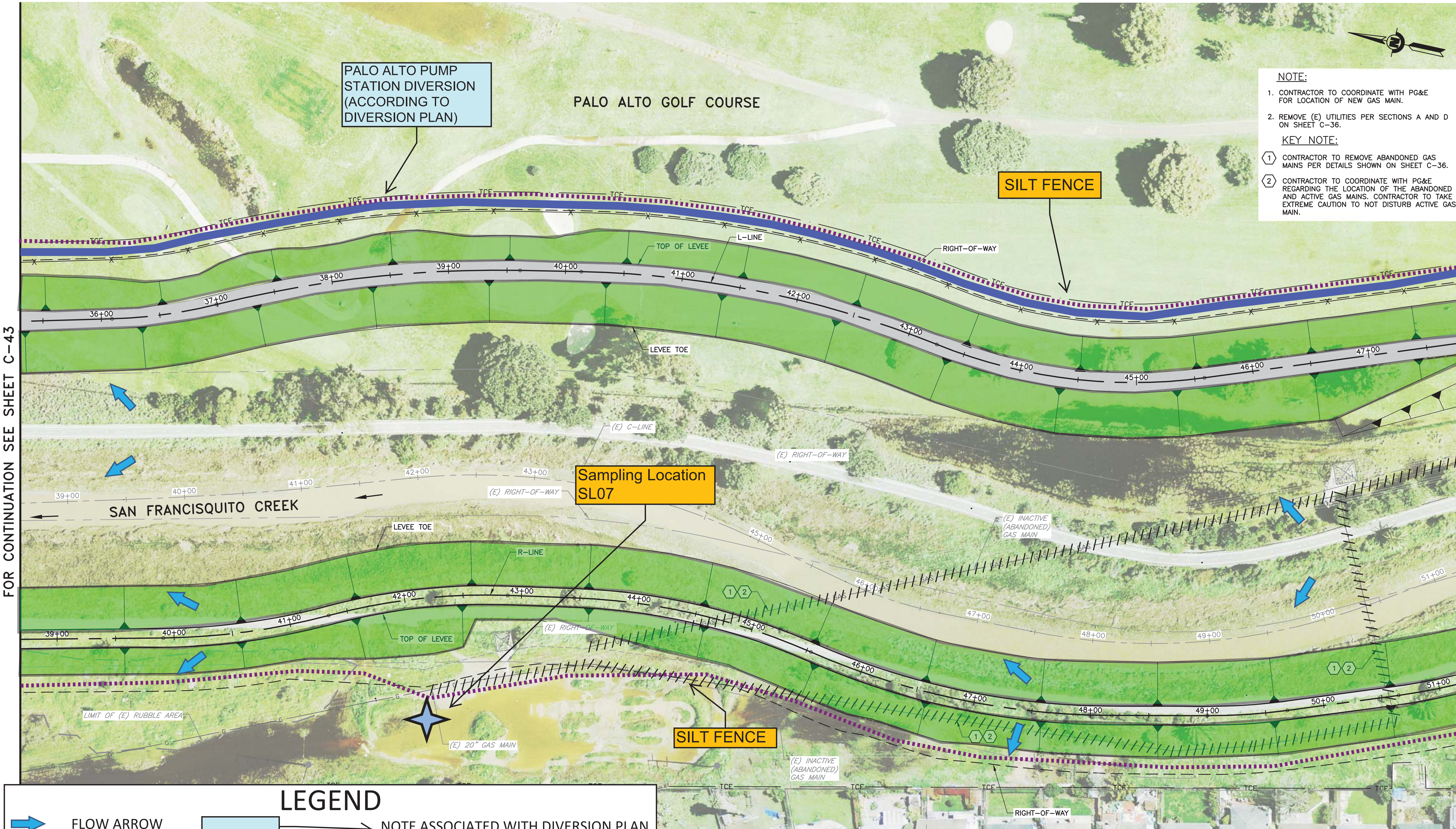
WPCD-06

VERIFY SCALES: BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHEET CODE: C-43

SHEET NUMBER: 58 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXX



NOTE:

1. CONTRACTOR TO COORDINATE WITH PG&E FOR LOCATION OF NEW GAS MAIN.
2. REMOVE (E) UTILITIES PER SECTIONS A AND D ON SHEET C-36.

KEY NOTE:

(1) CONTRACTOR TO REMOVE ABANDONED GAS MAINS PER DETAILS SHOWN ON SHEET C-36.

(2) CONTRACTOR TO COORDINATE WITH PG&E REGARDING THE LOCATION OF THE ABANDONED AND ACTIVE GAS MAINS. CONTRACTOR TO TAKE EXTREME CAUTION TO NOT DISTURB ACTIVE GAS MAIN.

LEGEND

- FLOW ARROW
- DI PROTECTION
- SAMPLING LOCATION
- SILT FENCE
- STABILIZED CONSTRUCTION ENTRANCE/EXIT
- AREA TO BE HYDROSEEDED
- NOTE ASSOCIATED WITH DIVERSION PLAN
- BAKER TANK
- COFFERDAM
- ENERGY DISSIPATOR DEVICE
- PUMP STATION
- SETTLEMENT TANK
- DIVERSION ROUTE

PLAN

SCALE: 1"=40'

CERTIFICATION

P. HRADILEK | PROJECT ENGINEER | DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER | DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

UTILITY PLAN
STA 39+00 TO STA 51+00 (C-LINE)

WPCD-07

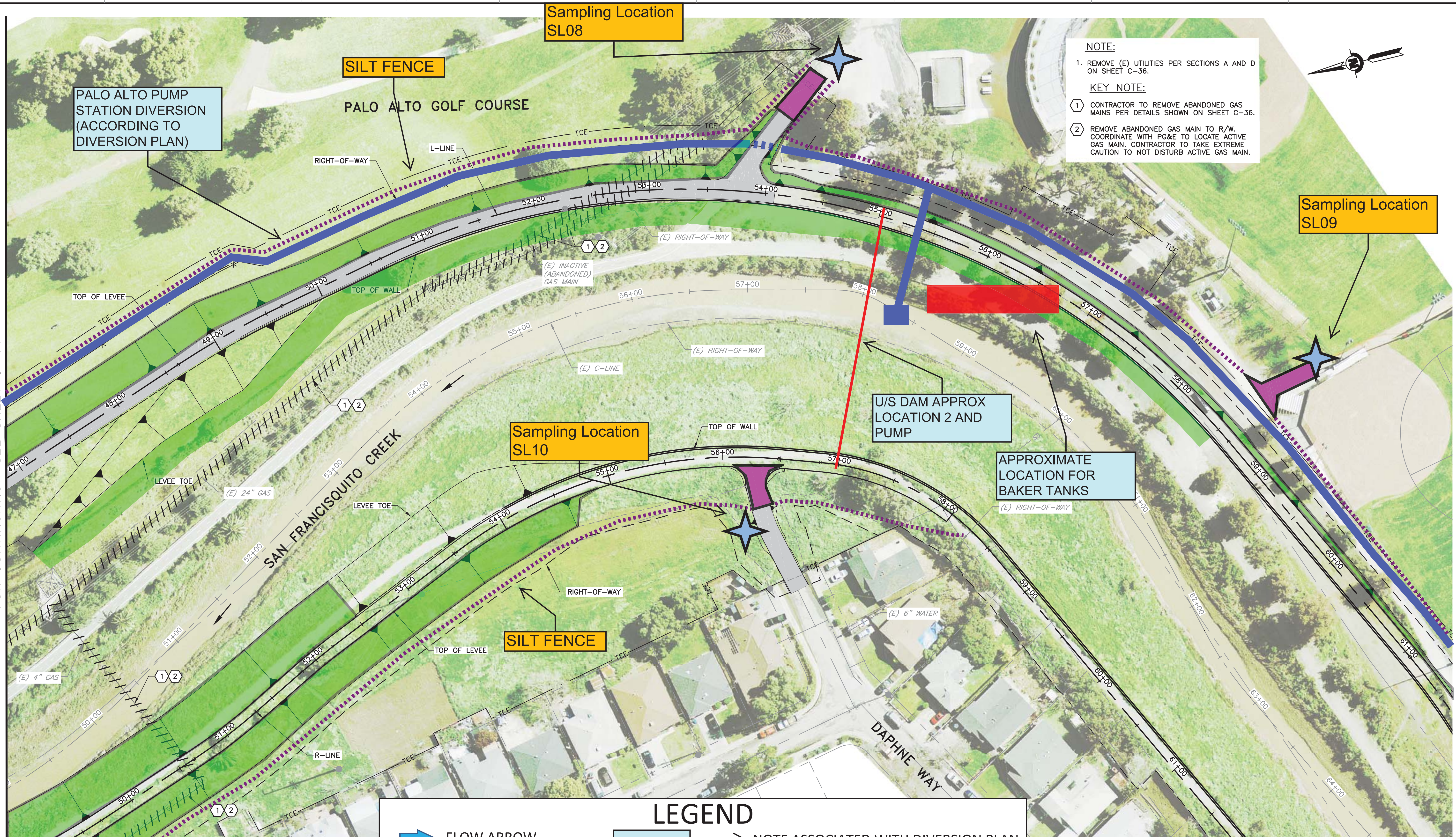
VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHEET CODE: C-44

SHEET NUMBER: 59 OF 126

USERNAME: BillShod Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\C-44

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXX



FOR CONTINUATION SEE SHEET C-46

NOTE:

1. REMOVE (E) UTILITIES PER SECTIONS A AND D ON SHEET C-36.

KEY NOTE:

1. CONTRACTOR TO REMOVE ABANDONED GAS MAINS PER DETAILS SHOWN ON SHEET C-36.
2. REMOVE ABANDONED GAS MAIN TO R/W. COORDINATE WITH PG&E TO LOCATE ACTIVE GAS MAIN. CONTRACTOR TO TAKE EXTREME CAUTION TO NOT DISTURB ACTIVE GAS MAIN.

LEGEND

- FLOW ARROW
- DI PROTECTION
- SAMPLING LOCATION
- SILT FENCE
- STABILIZED CONSTRUCTION ENTRANCE/EXIT
- AREA TO BE HYDROSEEDED
- NOTE ASSOCIATED WITH DIVERSION PLAN
- BAKER TANK
- COFFERDAM
- ENERGY DISSIPATOR DEVICE
- PUMP STATION
- SETTLEMENT TANK
- DIVERSION ROUTE

REV	DESCRIPTION	DATE	APPR.

SHEET DESCRIPTION:
...N FRANCISQUITO CREEK
...D REDUCTION, ECOSYSTEM
...TION, & RECREATION PROJECT
UTILITY PLAN
...51+00 TO STA 63+00 (C-LINE)

WPCD-08

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHEET CODE: C-45

SHEET NUMBER: 60 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXX

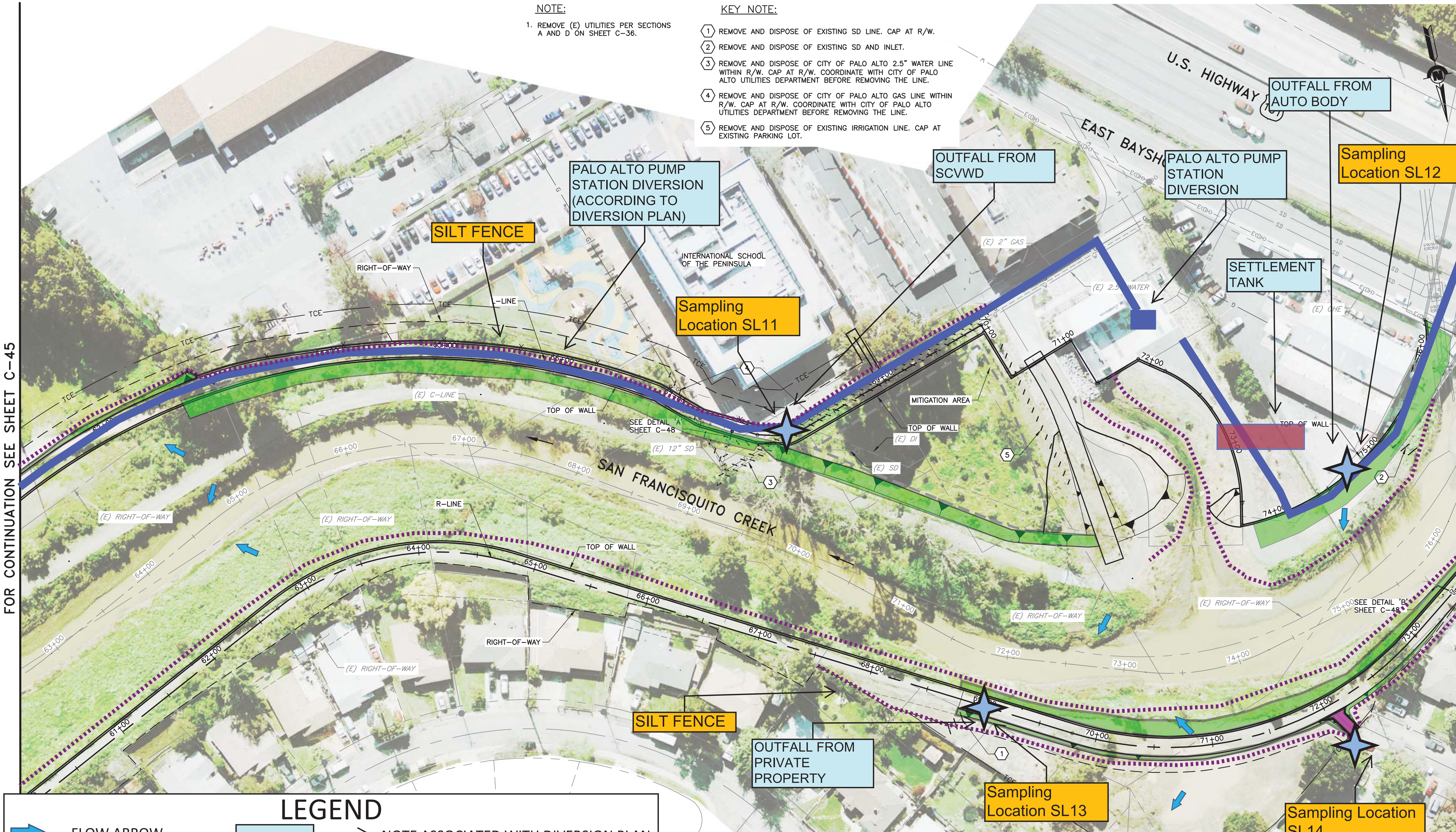
USERNAME: BillShod Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\sac\d0171341\C-45

NOTE:

1. REMOVE (E) UTILITIES PER SECTIONS A AND D ON SHEET C-36.

KEY NOTE:

1. REMOVE AND DISPOSE OF EXISTING SD LINE. CAP AT R/W.
2. REMOVE AND DISPOSE OF EXISTING SD AND INLET.
3. REMOVE AND DISPOSE OF CITY OF PALO ALTO 2.5" WATER LINE WITHIN R/W. CAP AT R/W. COORDINATE WITH CITY OF PALO ALTO UTILITIES DEPARTMENT BEFORE REMOVING THE LINE.
4. REMOVE AND DISPOSE OF CITY OF PALO ALTO GAS LINE WITHIN R/W. CAP AT R/W. COORDINATE WITH CITY OF PALO ALTO UTILITIES DEPARTMENT BEFORE REMOVING THE LINE.
5. REMOVE AND DISPOSE OF EXISTING IRRIGATION LINE. CAP AT EXISTING PARKING LOT.



FOR CONTINUATION SEE SHEET C-45

FOR CONTINUATION SEE SHEET C-47

LEGEND

FLOW ARROW	NOTE ASSOCIATED WITH DIVERSION PLAN
DI PROTECTION	BAKER TANK
SAMPLING LOCATION	COFFERDAM
SILT FENCE	ENERGY DISSIPATOR DEVICE
STABILIZED CONSTRUCTION ENTRANCE/EXIT	PUMP STATION
AREA TO BE HYDROSEEDED	SETTLEMENT TANK
	DIVERSION ROUTE

PLAN

SCALE: 1"=40'

CERTIFICATION

DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER

DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

UTILITY PLAN

STA 63+00 TO STA 73+00 (C-LINE)

WPCD-09

VERIFY SCALES

BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

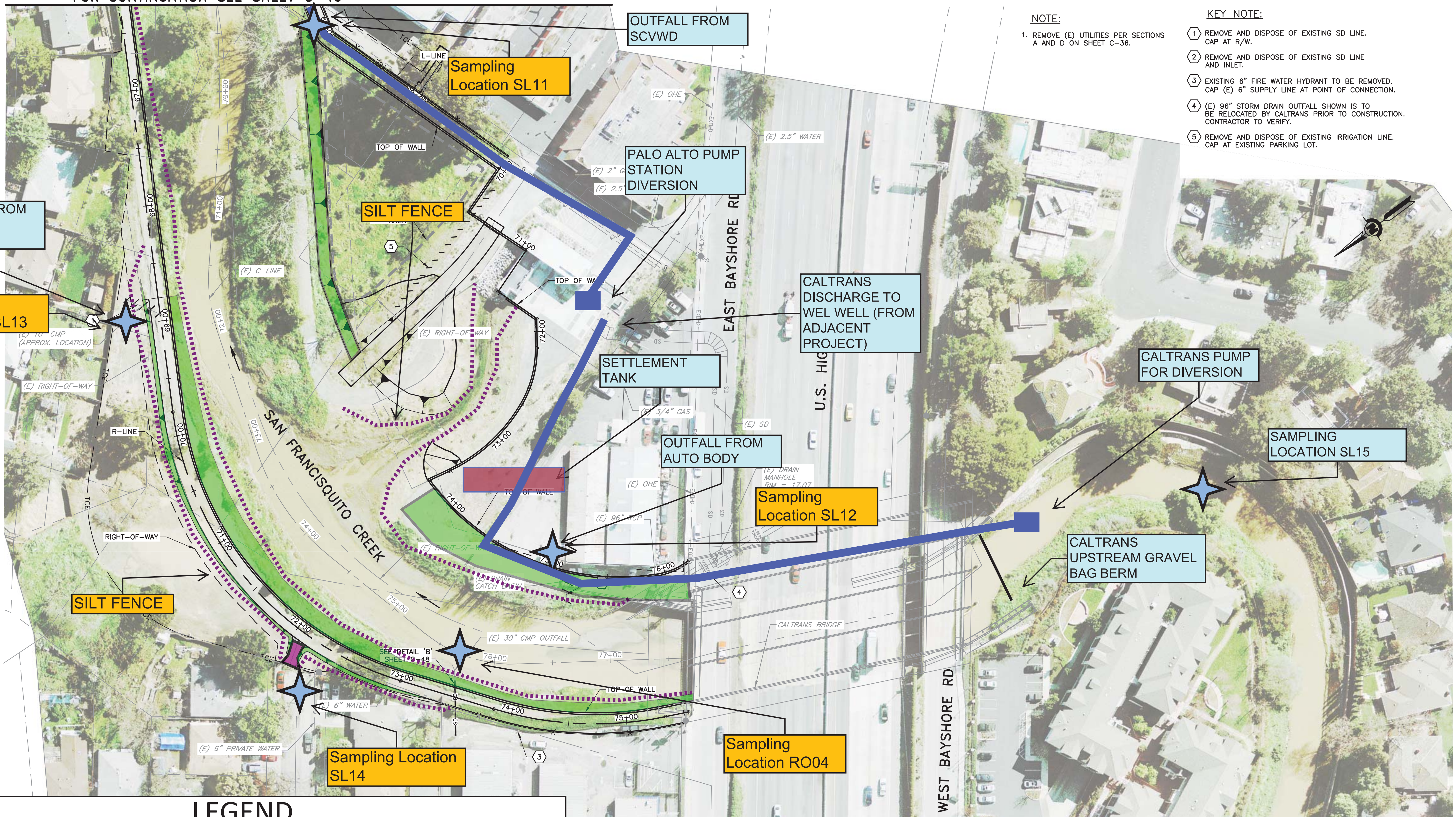
SHEET CODE: C-46

SHEET NUMBER: 61 OF 126

DOCUMENT NUMBER: SFC_LP-C-1028-XXXXXX

USERNAME: BillShod Tue 08 Jul 2008 09:32am FILENAME: C:\pwworking\soc\d0171341\C-46

FOR CONTINUATION SEE SHEET C-46



NOTE:

1. REMOVE (E) UTILITIES PER SECTIONS A AND D ON SHEET C-36.

KEY NOTE:

1. REMOVE AND DISPOSE OF EXISTING SD LINE. CAP AT R/W.
2. REMOVE AND DISPOSE OF EXISTING SD LINE AND INLET.
3. EXISTING 6" FIRE WATER HYDRANT TO BE REMOVED. CAP (E) 6" SUPPLY LINE AT POINT OF CONNECTION.
4. (E) 96" STORM DRAIN OUTFALL SHOWN IS TO BE RELOCATED BY CALTRANS PRIOR TO CONSTRUCTION. CONTRACTOR TO VERIFY.
5. REMOVE AND DISPOSE OF EXISTING IRRIGATION LINE. CAP AT EXISTING PARKING LOT.

LEGEND

FLOW ARROW
DI PROTECTION
SAMPLING LOCATION
SILT FENCE
STABILIZED CONSTRUCTION ENTRANCE/EXIT
AREA TO BE HYDROSEEDED
NOTE ASSOCIATED WITH DIVERSION PLAN
BAKER TANK
COFFERDAM
ENERGY DISSIPATOR DEVICE
PUMP STATION
SETTLEMENT TANK
DIVERSION ROUTE

PLAN

SCALE: 1"=40'

ENGINEERING CERTIFICATION
LANCE M. JONES C68374 Exp. CIVIL STATE OF CALIFORNIA
PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY
ACCEPTED BY DISTRICT
PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:
SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT
UTILITY PLAN
STA 70+00 TO STA 77+50 (C-LINE)

WPCD-10

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

SHEET CODE: C-47
SHEET NUMBER: 62 OF 126

FOR CONTINUATION SEE SHEET G-10

LIMITS OF RUBBLE MOUND (SEE SHEETS G-8 & G-9)

POINT #	NORTHING	EASTING
1	1993314.64	6090490.37
2	1993328.86	6090492.51
3	1993359.40	6090486.08
4	1993376.85	6090491.06
5	1993409.95	6090481.44
6	1993434.94	6090476.91
7	1993479.97	6090462.50
8	1993499.85	6090454.55
9	1993547.78	6090445.15
10	1993584.74	6090443.36
11	1993618.72	6090438.38
12	1993638.50	6090433.69
13	1993663.08	6090430.75
14	1993706.24	6090422.06
15	1993721.20	6090420.14
16	1993735.37	6090418.69
17	1993741.06	6090418.27
18	1993793.77	6090409.00
19	1993845.44	6090398.41
20	1993896.39	6090384.07

LIMITS OF RUBBLE MOUND (SEE SHEETS G-8 & G-9)

POINT #	NORTHING	EASTING
21	1993946.75	6090373.24
22	1993996.18	6090363.37
23	1994009.04	6090355.38
24	1994014.91	6090348.39
25	1994011.72	6090338.50
26	1994020.81	6090340.07
27	1994031.30	6090344.21
28	1994076.33	6090336.14
29	1994119.55	6090318.15
30	1994159.80	6090312.12
31	1994197.19	6090302.25
32	1994232.00	6090296.93
33	1994266.09	6090282.08
34	1994272.91	6090267.58
35	1994287.00	6090238.76
36	1994292.20	6090207.84
37	1994296.57	6090195.45
38	1994302.12	6090193.40
39	1994305.46	6090189.49
40	1994321.18	6090137.95

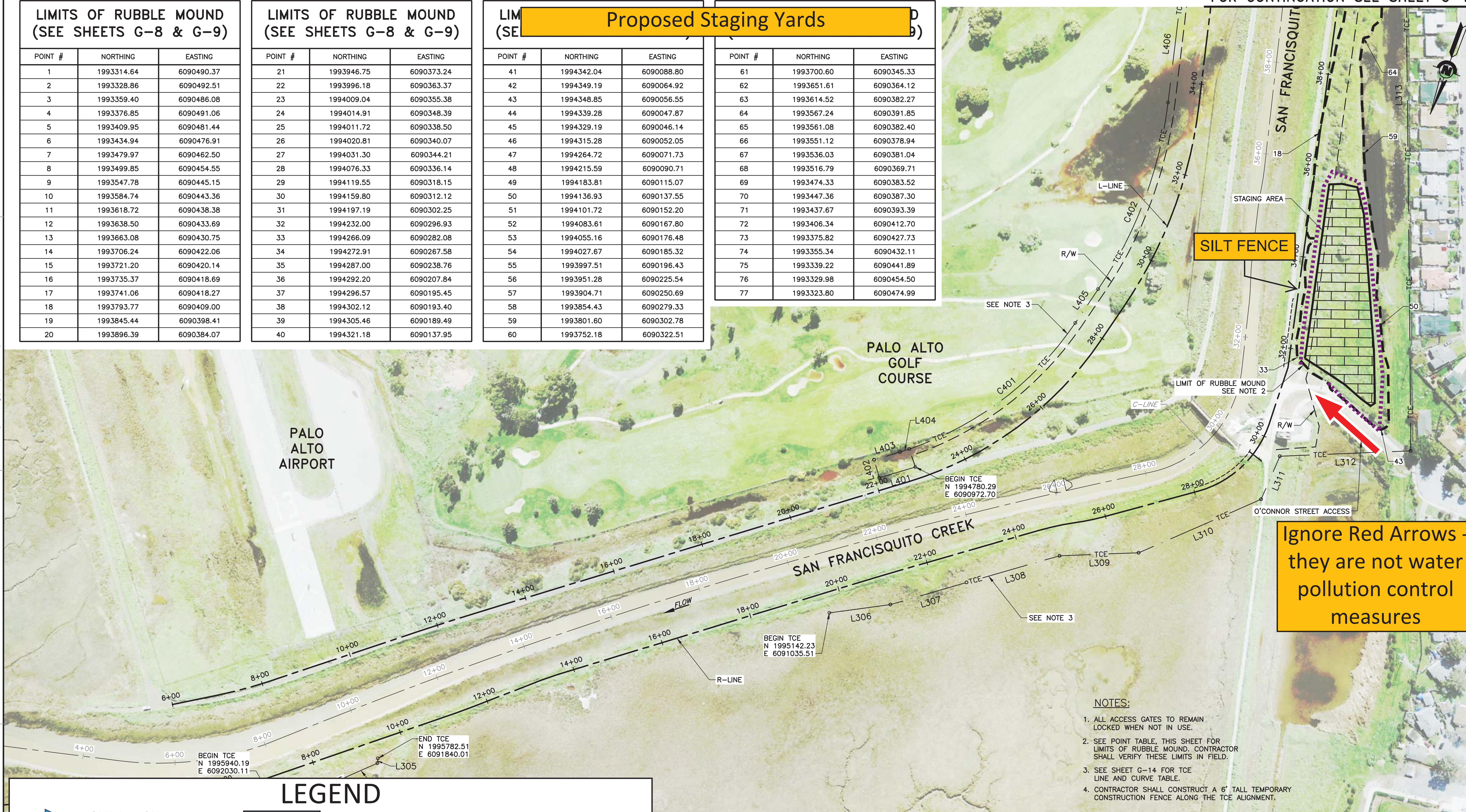
LIM (SE

Proposed Staging Yards

POINT #	NORTHING	EASTING
41	1994342.04	6090088.80
42	1994349.19	6090064.92
43	1994348.85	6090056.55
44	1994339.28	6090047.87
45	1994329.19	6090046.14
46	1994315.28	6090052.05
47	1994264.72	6090071.73
48	1994215.59	6090090.71
49	1994183.81	6090115.07
50	1994136.93	6090137.55
51	1994101.72	6090152.20
52	1994083.61	6090167.80
53	1994055.16	6090176.48
54	1994027.67	6090185.32
55	1993997.51	6090196.43
56	1993951.28	6090225.54
57	1993904.71	6090250.69
58	1993854.43	6090279.33
59	1993801.60	6090302.78
60	1993752.18	6090322.51

D 9)

POINT #	NORTHING	EASTING
61	1993700.60	6090345.33
62	1993651.61	6090364.12
63	1993614.52	6090382.27
64	1993567.24	6090391.85
65	1993561.08	6090382.40
66	1993551.12	6090378.94
67	1993536.03	6090381.04
68	1993516.79	6090369.71
69	1993474.33	6090383.52
70	1993447.36	6090387.30
71	1993437.67	6090393.39
72	1993406.34	6090412.70
73	1993375.82	6090427.73
74	1993355.34	6090432.11
75	1993339.22	6090441.89
76	1993329.98	6090454.50
77	1993323.80	6090474.99



NOTES:

1. ALL ACCESS GATES TO REMAIN LOCKED WHEN NOT IN USE.
2. SEE POINT TABLE, THIS SHEET FOR LIMITS OF RUBBLE MOUND. CONTRACTOR SHALL VERIFY THESE LIMITS IN FIELD.
3. SEE SHEET G-14 FOR TCE LINE AND CURVE TABLE.
4. CONTRACTOR SHALL CONSTRUCT A 6' TALL TEMPORARY CONSTRUCTION FENCE ALONG THE TCE ALIGNMENT.

LEGEND

- FLOW ARROW
- DI PROTECTION
- SAMPLING LOCATION
- SILT FENCE
- STABILIZED CONSTRUCTION ENTRANCE/EXIT
- AREA TO BE HYDROSEEDED
- NOTE ASSOCIATED WITH DIVERSION PLAN
- BAKER TANK
- COFFERDAM
- ENERGY DISSIPATOR DEVICE
- PUMP STATION
- SETTLEMENT TANK
- DIVERSION ROUTE

AREA AND ACCESS POINTS

SCALE: 1"=100'

CERTIFICATION

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

STAGING AREA AND ACCESS POINTS
TCE LINE & CURVE PLAN, RUBBLE MOUND LIMITS

WPCD-11

VERIFY SCALES: BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

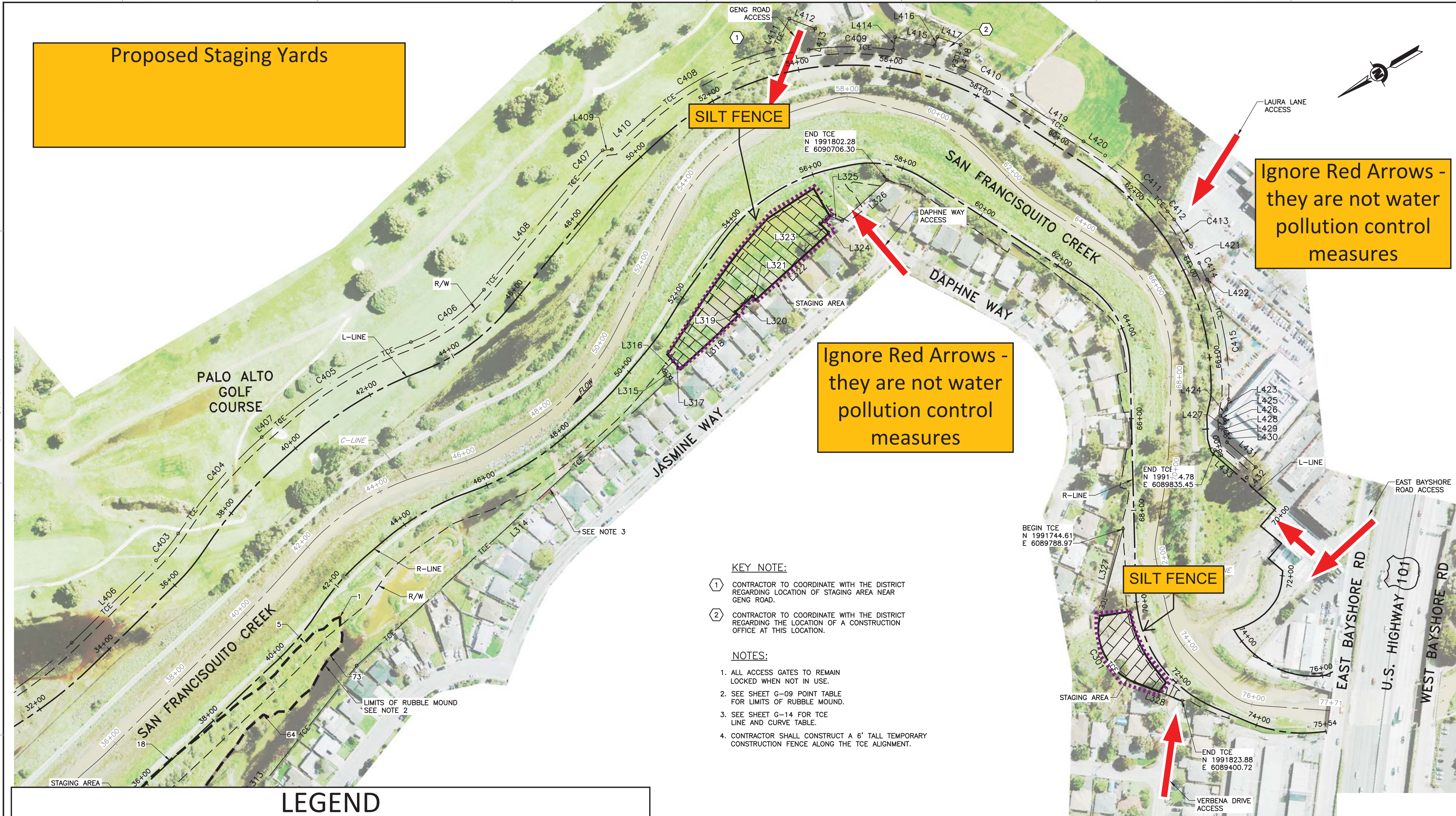
SHEET CODE: G-9

SHEET NUMBER: 9 OF 126

DOCUMENT NUMBER: SFC_LP-G-1028-XXXXXXX

USERNAME: BillShod Tue 08 Jul 2008 09:32am FILENAME: C:\pwworking\sac\d0171341\G-09

Proposed Staging Yards



KEY NOTE:

1. CONTRACTOR TO COORDINATE WITH THE DISTRICT REGARDING LOCATION OF STAGING AREA NEAR GENG ROAD.
2. CONTRACTOR TO COORDINATE WITH THE DISTRICT REGARDING THE LOCATION OF A CONSTRUCTION OFFICE AT THIS LOCATION.

NOTES:

1. ALL ACCESS GATES TO REMAIN LOCKED WHEN NOT IN USE.
2. SEE SHEET G-09 POINT TABLE FOR LIMITS OF RUBBLE MOUND.
3. SEE SHEET G-14 FOR TCE LINE AND CURVE TABLE.
4. CONTRACTOR SHALL CONSTRUCT A 6' TALL TEMPORARY CONSTRUCTION FENCE ALONG THE TCE ALIGNMENT.

LEGEND

- FLOW ARROW
- DI PROTECTION
- SAMPLING LOCATION
- SILT FENCE
- STABILIZED CONSTRUCTION ENTRANCE/EXIT
- AREA TO BE HYDROSEEDED
- NOTE ASSOCIATED WITH DIVERSION PLAN
- BAKER TANK
- COFFERDAM
- ENERGY DISSIPATOR DEVICE
- PUMP STATION
- SETTLEMENT TANK
- DIVERSION ROUTE

AREA AND ACCESS POINTS

SCALE: 1"=100'

CERTIFICATION

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER | DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT

STAGING AREA AND ACCESS POINTS TCE LINE & CURVE PLAN, RUBBLE MOUND LIMITS

WPCD-12

VERIFY SCALES — BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHEET CODE: G-10

SHEET NUMBER: 9 OF 126

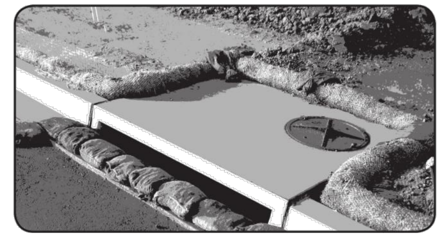
DOCUMENT NUMBER: SFC_LP-G-1028-XXXXXXX

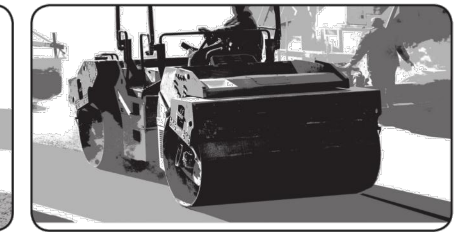
USERNAME: BillShod Tue 08 Jul 2008 09:32am FILENAME: C:\pwworking\sac\d0171341\G-10

POLLUTION PREVENTION — IT'S PART OF THE PLAN

Construction projects are required to implement year-round stormwater BMPs, as they apply to your project.

Runoff from streets and other paved areas is a major source of pollution to San Francisco Bay. Construction activities can directly affect the health of the Bay unless contractors and crews plan ahead to keep construction dirt, debris, and other pollutants out of storm drains and local creeks. Following these guidelines will ensure your compliance with City of Palo Alto Ordinance requirements.





MATERIALS & WASTE MANAGEMENT

Non-Hazardous Materials

- ☐ Berm and cover stockpiles of sand, dirt or other construction material with tarps when rain is forecast or when they are not in use.
- ☐ Use (but don't overuse) reclaimed water for dust control.
- ☐ Ensure dust control water doesn't leave site or discharge to storm drains.

Hazardous Materials

- ☐ Label all hazardous materials and hazardous wastes (such as pesticides, paints, thinners, solvents, fuel, oil, and antifreeze) in accordance with city, county, state and federal regulations.
- ☐ Store hazardous materials and wastes in water tight containers, store in appropriate secondary containment, and cover them at the end of every work day or during wet weather or when rain is forecast.
- ☐ Follow manufacturer's application instructions for hazardous materials and do not use more than necessary. Do not apply chemicals outdoors when rain is forecast within 24 hours.
- ☐ Arrange for appropriate disposal of all hazardous wastes.

Waste Management

- ☐ Cover and maintain dumpsters. Check frequently for leaks. Place dumpsters under roofs or cover with tarps or plastic sheeting secured around the outside of the dumpster. A plastic liner is recommended to prevent leaks. Never clean out a dumpster by hosing it down on the construction site.
- ☐ Place portable toilets away from storm drains. Make sure they are in good working order. Check frequently for leaks.
- ☐ Dispose of all wastes and demolition debris properly. Recycle materials and wastes that can be recycled, including solvents, water-based paints, vehicle fluids, broken asphalt and concrete, wood, and cleared vegetation.
- ☐ Dispose of liquid residues from paints, thinners, solvents, glues, and cleaning fluids as hazardous waste.
- ☐ Keep site clear of litter (e.g. lunch items, cigarette butts).
- ☐ Prevent litter from uncovered loads by covering loads that are being transported to and from site.

Construction Entrances and Perimeter

- ☐ Establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from site and tracking off site.
- ☐ Sweep or vacuum any street tracking immediately and secure sediment source to prevent further tracking. Never hose down streets to clean up tracking.

EQUIPMENT MANAGEMENT & SPILL CONTROL

Maintenance and Parking

- ☐ Designate an area of the construction site, well away from streams or storm drain inlets and fitted with appropriate BMPs, for auto and equipment parking, and storage.
- ☐ Perform major maintenance, repair jobs, and vehicle and equipment washing off site.
- ☐ If refueling or vehicle maintenance must be done onsite, work in a bermed area away from storm drains and over a drip pan or drop cloths big enough to collect fluids. Recycle or dispose of fluids as hazardous waste.
- ☐ If vehicle or equipment cleaning must be done onsite, clean with water only in a bermed area that will not allow rinse water to run into gutters, streets, storm drains, or surface waters.
- ☐ Do not clean vehicle or equipment onsite using soaps, solvents, degreasers, or steam cleaning equipment, and do not use diesel oil to lubricate equipment or parts onsite.

Spill Prevention and Control

- ☐ Keep spill cleanup materials (e.g., rags, absorbents and cat litter) available at the construction site at all times.
- ☐ Maintain all vehicles and heavy equipment. Inspect frequently for and repair leaks. Use drip pans to catch leaks until repairs are made.
- ☐ Clean up leaks, drips and other spills immediately and dispose of cleanup materials properly.
- ☐ Use dry cleanup methods whenever possible (absorbent materials, cat litter and/or rags).
- ☐ Sweep up spilled dry materials immediately. Never attempt to "wash them away" with water, or bury them.
- ☐ Clean up spills on dirt areas by digging up and properly disposing of contaminated soil.
- ☐ Report any hazardous materials spills immediately! Call City of Palo Alto Communications, **(650) 329-2413**. If the spill poses a significant hazard to human health and safety, property or the environment, you must report it to the State Office of Emergency Services. **(800) 852-7550 (24 hours).**

EARTHMOVING

Grading and Earthwork

- ☐ Schedule grading and excavation work during dry weather.
- ☐ Stabilize all denuded areas, install and maintain temporary erosion controls (such as erosion control fabric or bonded fiber matrix) until vegetation is established.
- ☐ Remove existing vegetation only when absolutely necessary, plant temporary vegetation for erosion control on slopes or where construction is not immediately planned.
- ☐ Prevent sediment from migrating offsite and protect storm drain inlets, drainage courses and streams by installing and maintaining appropriate BMPs (e.g., silt fences, gravel bags, fiber rolls, temporary swales, etc.).
- ☐ Keep excavated soil on site and transfer it to dump trucks on site, not in the streets.

Contaminated Soils

- ☐ If any of the following conditions are observed, test for contamination and contact the Regional Water Quality Control Board:
  - Unusual soil conditions, discoloration, or odor.
  - Abandoned underground tanks.
  - Abandoned wells.
  - Buried barrels, debris, or trash.
- ☐ If the above conditions are observed, document any signs of potential contamination and clearly mark them so they are not distrurbed by construction activities.

Landscaping

- ☐ Protect stockpiled landscaping materials from wind and rain by storing them under tarps all year-round.
- ☐ Stack bagged material on pallets and under cover.
- ☐ Discontinue application of any erodible landscape material within 2 days before a forecast rain event or during wet weather.

CONCRETE MANAGEMENT & DEWATERING

Concrete Management

- ☐ Store both dry and wet materials under cover, protected from rainfall and runoff and away from storm drains or waterways. Store materials off the ground, on pallets. Protect dry materials from wind.
- ☐ Wash down exposed aggregate concrete only when the wash water can (1) flow onto a dirt area; (2) drain onto a bermed surface from which it can be pumped and disposed of properly; or (3) block any storm drain inlets and vacuum washwater from the gutter. If possible, sweep first.
- ☐ Wash out concrete equipment/trucks offsite or in a designated washout area, where the water will fl ow into a temporary waste pit, and make sure wash water does not leach into the underlying soil. (See CASQA Construction BMP Handbook for properly designed concrete washouts.)

Dewatering

- ☐ Reuse water for dust control, irrigation or another on-site purpose to the greatest extent possible.
- ☐ Be sure to obtain a Permit for Construction in the Public Street from Public Works Engineering before discharging water to a street, gutter, or storm drain. Call the Regional Water Quality Control Plant (RWQCP) at **(650) 329-2598** for an inspection prior to commencing discharge. Use filtration or diversion through a basin, tank, or sediment trap as required by the approved dewatering plan. Dewatering is not permitted from October to April.
- ☐ In areas of known contamination, testing is required prior to reuse or discharge of groundwater. Consult with the City inspector to determine what testing to do and to interpret results. Contaminated groundwater must be treated or hauled off-site for proper disposal.

PAVING/ASPHALT WORK

Paving

- ☐ Avoid paving and seal coating in wet weather or when rain is forecast, to prevent materials that have not cured from contacting stormwater runoff.
- ☐ Cover storm drain inlets and manholes when applying seal coat, slurry seal, fog seal, or similar materials.
- ☐ Collect and recycle or appropriately dispose of excess abrasive gravel or sand. Do NOT sweep or wash it into gutters.

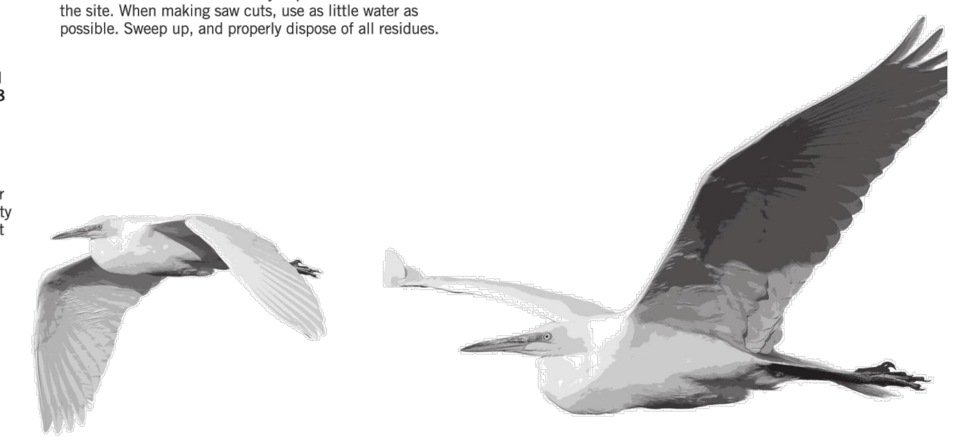
Sawcutting & Asphalt/Concrete Removal

- ☐ Protect storm drain inlets during saw cutting.
- ☐ If saw cut slurry enters a catch basin, clean it up immediately.
- ☐ Shovel or vacuum saw cut slurry deposits and remove from the site. When making saw cuts, use as little water as possible. Sweep up, and properly dispose of all residues.

PAINTING & PAINT REMOVAL

Painting Cleanup and Removal

- ☐ Never clean brushes or rinse paint containers into a street, gutter, storm drain, or stream.
- ☐ For water-based paints, paint out brushes to the extent possible, and rinse into a drain that goes to the sanitary sewer. Never pour paint down a storm drain.
- ☐ For oil-based paints, paint out brushes to the extent possible and clean with thinner or solvent in a proper container. Filter and reuse thinners and solvents. Dispose of excess liquids as hazardous waste.
- ☐ Sweep up or collect paint chips and dust from non-hazardous dry stripping and sand blasting into plastic drop cloths and dispose of as trash.
- ☐ Chemical paint stripping residue and chips and dust from marine paints or paints containing lead, mercury, or tributyltin must be disposed of as hazardous waste. Lead based paint removal requires a state certified contractor.



STORM DRAIN POLLUTERS MAY BE LIABLE FOR FINES OF UP TO $10,000 PER DAY!

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cityofpaloalto.org

CITY OF PALO ALTO

USERNAME: BillShod Tue 08 Jul 2008 09:32am
FILENAME: C:\pwworking\soc\d0171341\G-06

DOCUMENT NUMBER: SFC_LP-G-1028-XXXXXXX

REV	DESCRIPTION	DATE	APPR.

HDR

DATE	JULY 2015
DESIGN	L. JONES
DRAWN	H. SUAREZ
CHECKED	P. HRADILEK

ENGINEERING CERTIFICATION

REGISTERED PROFESSIONAL ENGINEER LANCE M. JONES 08374 Exp. 9/30/17 CIVIL STATE OF CALIFORNIA

PROJECT ENGINEER DATE

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

ACCEPTED BY DISTRICT

PROJECT ENGINEER DATE

PROJECT NAME AND SHEET DESCRIPTION:

SAN FRANCISQUITO CREEK FLOOD REDUCTION, ECOSYSTEM RESTORATION, & RECREATION PROJECT
CITY OF PALO ALTO
SWPPP REQUIREMENTS

WPCD-13

VERIFY SCALES
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

SHEET CODE: G-6

SHEET NUMBER: 6 OF 126

City of Palo Alto
Hydroseed Specifications
Suitable for Watershed and Other Areas

Prepared by Dave Dockter-Landscape Specialist, Planning Department Revised 08/06

1. The area to be seeded shall have a firm seedbed, which has previously been roughened by scarifying, disking, harrowing, chiseling, track-walking or otherwise worked to a depth of 2 to 4-inches unless roughened condition already exists. See direction for flat or graded slopes.

2. Revegetation on the graded slopes: Warning--no implement shall be used that will create an excessive amount of downward movement of soil.
   a. Apply approximately 2-inch layer of local mulch.
   b. Seed the following:

SPECIES		RATE (lb/ac)
California Brome	Bromus carinatus	10.0
Blue Wildrye	Leymus glaucus	8.0
Sky Lupine	Lupinus nannus	2.5
California Poppy	Escholzia californica	1.5
Purple Owl's Clover	Castilleja exerta	1.0
California Sagebrush	Artemesia californica	4.0
Black Sage	Salvia mellifera	3.0
Monkeyflower	Mimulus aurantiacus	3.0
Deerweed	Lotus scoparius	3.0
Coffeeberry	Rhamnus californica	2.0

   c. Apply a second layer of mulch, again 2 to 3-inches thickness.
   d. Place wattle rolls perpendicular to the slope fall line every 10-foot down the slopes: secure these with 2-inch stakes every 10-foot.

3. Revegetation in flat (meadow) areas:
   a. Seed the following:

SPECIES		RATE (lb/ac)
Purple Needle Grass	Nasella pulchra	6.0
Creeping Wild Rye	Leymus triiticoides	4.0
California Brome	Bromus carinatus	12.0
Blue Wildrye	Elymus glaucus	10.0
Sky Lupine	Lupinus nannus	2.5
California Poppy	Escholzia californica	1.5
Blue-Eyed-Grass	Sisyrinchium bellum	1.0

   b. Apply a 2 to 3-inch layer of the local mulch
   c. Trackwalk the mulch into the soil surface or meadow floor

4. The hydroseeder shall be equipped with a built-in continuous agitation system of sufficient operating capacity to produce a homogeneous slurry and a discharge system that applies the slurry to the slopes at a continuous and uniform rate. Seed shall not remain in the slurry longer than 30-minutes. The slurry shall contain the required fertilizer and shall also contain wood fiber at the rate of 1500-pounds of wood fiber per acre. The water used shall be potable water or class 1 or 2 agricultural irrigation water. The slurry shall be continuously mixed and shall be mixed at least 5-minutes after the last addition before application starts. The slurry shall be applied at a rate that is non-erosive and minimizes runoff.

5. Critical planting area sites shall be inspected no more than 30-days after the first rain. Written record of this first inspection shall be forwarded to the City Department Planner for the project. Follow up inspections should occur between 60 and 90-days after the first inspection and once again in the spring. If the site is well stabilized (not yielding sediment) in the spring inspections, no further inspection shall be necessary. If the spring inspection or any other inspection reveals that the slopes need to be repaired in that the seed has not taken or erosion has taken place, slopes shall be reseeded and/or repaired. The slopes shall be smoothed over, including the filling or rills and/or gullies before reseeding starts. The seeding operation shall be the same as specified above.

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RELOCATION & PLANTING OF FINE SPECIMEN TREES
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ROCKERY/HARDWARE/IRRIGATION

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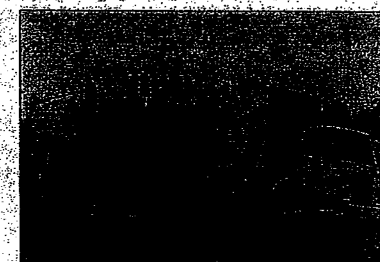

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www.atoztreesnursery.com

HYDROSEEDING CAN RESULT IN SAVINGS OF 50% & MORE

COST COMPARISON*	SOD vs. per sq. ft.	HYDROSEEDING per sq. ft.
Rip, Rototilling, and Leveling	.03	.03
Soil Prep. (amendments)	.10	.10
Hand Grading	.02	.02
Sod Purchase/Hydroseeding Materials	.27	.05
Labor to Install	.04	.01
TOTAL	.46	.20

* Costs are approximate based on 1 acre of tall fescue lawn.

HYDROSEEDING

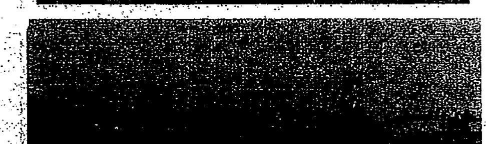
Hydroseeding is a process whereby seed, water, fertilizer, and a wood fiber mulch are mixed together and applied over the ground. In one application, the ground is seeded, fertilized, and mulched. Because the mulch fibers can retain up to 10 times their weight in water, seeds are kept moist. The mulch fiber helps prevent wind and water erosion, protects young seeds from the sun and helps soil temperature. It forms an almost perfect environment for maximum germination. As the plants mature, the mulch fiber will gradually decompose and add nourishment to the soil.

EROSION CONTROL AND SLOPE STABILIZATION
A to Z Hydroseeding has helped many contractors meet state and county specifications on excavated sites, land fills, and road cuts. We can also recommend effective seed mixes for jobs lacking specifications. Our hoses can reach up to 300 feet from the truck to cover those hard to reach areas.

LARGE SEEDED TURF AREAS
Hydroseeding has proven to be very cost effective in establishing attractive lawns for industrial parks, apartment

- Erosion Control, Turfgrass, & Wildflowers, we can apply any type of seed you want!
- Prompt response on requests for estimates!
- Our experienced crew can give you consistency in coverage!
- We use Top Quality Materials and have Competitive Prices!
- We will do work anywhere in the greater Bay Area, from Marin to Monterey!

"Hydroseeding is the most cost effective method for large scale seeding (1/4 arce +)"



Attachment C

BMP Consideration Checklists

CONSTRUCTION SITE BMPs CONSIDERATION CHECKLIST

EROSION CONTROL BMPs

BMP No.	BMP	CONSIDERED FOR PROJECT?	"X", IF USED	"X", IF NOT USED	IF NOT USED, STATE REASON
EC-1	Scheduling	YES	X		
EC-2	Preservation of Existing Vegetation	YES	X		
EC-3	Hydraulic Mulch	NO		X	Hydroseeding will be used for this project
EC-4	Hydroseeding	YES	X		
EC-5	Soil Binders	NO		X	Not necessary for this project
EC-6	Straw Mulch	YES	X		
EC-7	Geotextiles & Mats	YES	X		
EC-8	Wood Mulching	NO		X	Not necessary for this project
EC-9	Earth Dikes & Drainage Swales	NO		X	
EC-10	Velocity Dissipation Devices	YES	X		
EC-11	Slope Drains	YES		X	Not necessary for this project
EC-12	Streambank Stabilization	YES	X		Not necessary for this project
EC-13	Polyacrylamide	NO		X	Not necessary for this project

SEDIMENT CONTROL BMPs

BMP No.	BMP	CONSIDERED FOR PROJECT?	"X", IF USED	"X", IF NOT USED	IF NOT USED, STATE REASON
SE-1	Silt Fence	YES	X		
SE-2	Sediment Basin	YES		X	Not anticipated at this time, however will amend into plan in needed
SE-3	Sediment Trap	NO		X	
SE-4	Check Dam	YES	X		
SE-5	Fiber Rolls	YES	X		
SE-6	Gravel Bag Berm	YES	X		
SE-7	Street Sweeping and Vacuuming	YES	X		
SE-8	Sand Bag Barrier	NO		X	Gravel Bag berms are preferred
SE-9	Straw Bale Barrier	NO		X	Not necessary for this project
SE-10	Storm Drain Inlet Protection	YES	X		
SE-11	Chemical Treatment	YES		X	ATS not mentioned in diversion plan, will amend into SWPPP if necessary

CONSTRUCTION SITE BMPs CONSIDERATION CHECKLIST					
WIND EROSION CONTROL BMPs					
BMP No.	**BMP**	**CONSIDERED FOR PROJECT**	**"X", IF USED**	**"X", IF NOT USED**	**IF NOT USED, STATE REASON**
WE-1	Wind Erosion	YES	X		
TRACKING CONTROL BMPs					
TC-1	Stabilized Construction Entrance/Exit	YES	X		
TC-2	Stabilized Construction Roadway	YES		X	Will be incorporated into Amendment if site conditions warrant the need
TC-3	Entrance/Outlet Tire Wash	NO		X	Not necessary for this project.
NON-STORM WATER MANAGEMENT BMPs					
NS-1	Water Conservation Practices	YES	X		
NS-2	Dewatering Operations	YES	X		
NS-3	Paving and Grinding Operations	YES	X		
NS-4	Temporary Stream Crossing	NO		X	Not necessary for this project
NS-5	Clear Water Diversion	YES	X		
NS-6	Illicit Connection/ Discharge	YES	X		
NS-7	Potable Water/Irrigation	YES	X		
NS-8	Vehicle and Equipment Cleaning	YES	X		
NS-9	Vehicle and Equipment Fueling	YES	X		
NS-10	Vehicle and Equipment Maintenance	YES	X		
NS-11	Pile Driving Operations	YES	X		
NS-12	Concrete Curing	YES	X		
NS-13	Concrete Finishing	YES	X		
NS-14	Material and Equipment Use Over Water	NO		X	Not necessary for this project
NS-15	Demolition Adjacent to Water	YES	X		
NS-16	Temporary Batch Plants	NO		X	Not anticipated on this project

CONSTRUCTION SITE BMPs CONSIDERATION CHECKLIST					
WASTE MANAGEMENT AND MATERIALS POLLUTION CONTROL BMPS					
BMP No.	BMP	CONSIDERED FOR PROJECT?	"X", IF USED	"X", IF NOT USED	IF NOT USED, STATE REASON
WM-1	Material Delivery and Storage	YES	X		
WM-2	Material Use	YES	X		
WM-3	Stockpile Management	YES	X		
WM-4	Spill Prevention and Control	YES	X		
WM-5	Solid Waste Management	YES	X		
WM-6	Hazardous Waste Management	YES	X		
WM-7	Contaminated Soil Management	YES	X		
WM-8	Concrete Waste Management	YES	X		
WM-9	Sanitary/Septic Waste Management	YES	X		
WM-10	Liquid Waste Management	YES	X		

Attachment D

Runoff Coefficient Calculations

Calculations for Runoff Coefficients

Existing Site Conditions

(A) Total Site Area	=	35.0	Acres
(B) Impervious Site Area [1]	=	2.5	Acres
(C) Impervious Site Area Runoff Coefficient	=	0.90	
(D) Pervious Site Area [2]	=	32.5	Acres
(E) Pervious Site Area Runoff Coefficient	=	0.20	
(F) Existing Site Area Runoff Coefficient $\frac{(B \times C) + (D \times E)}{(A)}$	=	0.25	

Site Conditions Following Construction

(A) Total Site Area	=	35.0	Acres
(B) Impervious Site Area [1]	=	3.5	Acres
(C) Impervious Site Area Runoff Coefficient	=	0.90	
(D) Pervious Site Area [2]	=	31.5	Acres
(E) Pervious Site Area Runoff Coefficient	=	0.20	
(F) Post-Construction Site Area Runoff Coefficient $\frac{(B \times C) + (D \times E)}{(A)}$	=	0.27	

1. Includes paved areas, areas covered by buildings, and other impervious surfaces.
2. Includes areas of vegetation, most unpaved or uncovered soil surfaces, and other pervious areas.

Attachment E

Calculations for Run-on Discharges

Calculations for Run-on Discharges

(A) Tributary Site for Off-site Area	=	1.6	Acres
(B) Area Rainfall Intensity[1]	=	0.094	In/Hr
(C) Area Runoff Coefficient[2]	=	0.9	
Off-site Run-on from Area	=	0.135	cfs

1. See attached Precipitation Frequency Chart for the 5-year, 24 hour storm intensity.
2. Coefficient based on an average, unimproved are coefficient from the Caltrans SWPPP Template.

Adjacent Properties Run-on Exhibit

(to show the approximate area where water will accumulate and run-on to the project)

Total run-on area = 1.6 acres

NOAA Atlas 14, Volume 6, Version 2
Location name: Palo Alto, California, US*
Latitude: 37.4621°, Longitude: -122.1241°
Elevation: 8 ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.15** (1.01-1.32)	**1.54** (1.34-1.76)	**2.04** (1.79-2.35)	**2.46** (2.14-2.86)	**3.04** (2.57-3.62)	**3.48** (2.89-4.24)	**3.95** (3.22-4.90)	**4.43** (3.52-5.63)	**5.08** (3.89-6.70)	**5.59** (4.15-7.60)
10-min	**0.822** (0.726-0.942)	**1.10** (0.966-1.26)	**1.46** (1.28-1.69)	**1.76** (1.54-2.05)	**2.18** (1.84-2.60)	**2.50** (2.08-3.04)	**2.83** (2.30-3.51)	**3.17** (2.52-4.03)	**3.64** (2.79-4.80)	**4.01** (2.98-5.45)
15-min	**0.664** (0.584-0.760)	**0.884** (0.776-1.02)	**1.18** (1.03-1.36)	**1.42** (1.24-1.65)	**1.76** (1.48-2.10)	**2.01** (1.67-2.45)	**2.28** (1.86-2.83)	**2.56** (2.03-3.25)	**2.94** (2.25-3.87)	**3.23** (2.40-4.39)
30-min	**0.454** (0.400-0.522)	**0.606** (0.532-0.696)	**0.808** (0.708-0.930)	**0.972** (0.848-1.13)	**1.20** (1.02-1.43)	**1.38** (1.15-1.68)	**1.56** (1.27-1.94)	**1.75** (1.39-2.23)	**2.01** (1.54-2.65)	**2.21** (1.64-3.01)
60-min	**0.320** (0.282-0.367)	**0.427** (0.375-0.490)	**0.568** (0.498-0.655)	**0.685** (0.597-0.795)	**0.846** (0.716-1.01)	**0.971** (0.807-1.18)	**1.10** (0.895-1.36)	**1.23** (0.979-1.57)	**1.42** (1.08-1.87)	**1.56** (1.16-2.12)
2-hr	**0.238** (0.210-0.273)	**0.316** (0.278-0.362)	**0.416** (0.364-0.479)	**0.496** (0.432-0.576)	**0.605** (0.512-0.722)	**0.688** (0.572-0.836)	**0.770** (0.626-0.956)	**0.854** (0.678-1.09)	**0.966** (0.740-1.27)	**1.05** (0.782-1.43)
3-hr	**0.201** (0.177-0.231)	**0.266** (0.234-0.306)	**0.349** (0.306-0.402)	**0.415** (0.362-0.482)	**0.504** (0.426-0.601)	**0.570** (0.474-0.693)	**0.637** (0.518-0.791)	**0.705** (0.559-0.896)	**0.794** (0.608-1.05)	**0.861** (0.640-1.17)
6-hr	**0.148** (0.131-0.170)	**0.194** (0.170-0.223)	**0.252** (0.221-0.290)	**0.299** (0.260-0.347)	**0.361** (0.305-0.431)	**0.408** (0.339-0.496)	**0.455** (0.370-0.564)	**0.502** (0.399-0.638)	**0.565** (0.433-0.745)	**0.613** (0.455-0.832)
12-hr	**0.100** (0.088-0.114)	**0.128** (0.112-0.147)	**0.165** (0.144-0.189)	**0.195** (0.170-0.226)	**0.236** (0.200-0.282)	**0.268** (0.223-0.326)	**0.300** (0.244-0.373)	**0.334** (0.265-0.425)	**0.380** (0.291-0.501)	**0.415** (0.308-0.564)
24-hr	**0.058** (0.052-0.067)	**0.073** (0.065-0.084)	**0.094** (0.083-0.108)	**0.111** (0.098-0.129)	**0.135** (0.115-0.161)	**0.153** (0.129-0.187)	**0.173** (0.142-0.215)	**0.193** (0.155-0.246)	**0.222** (0.172-0.293)	**0.245** (0.184-0.332)
2-day	**0.037** (0.033-0.043)	**0.047** (0.041-0.054)	**0.059** (0.053-0.068)	**0.070** (0.061-0.081)	**0.084** (0.072-0.100)	**0.095** (0.080-0.116)	**0.107** (0.088-0.132)	**0.118** (0.095-0.151)	**0.135** (0.104-0.177)	**0.147** (0.110-0.200)
	0.029	**0.036**	**0.046**	**0.054**	**0.064**	**0.072**	**0.081**	**0.089**	**0.101**	**0.109**

Attachment F

Notice of Intent (NOI)

Post-Construction Water Balance Calculator

User may make changes from any cell that is orange or brown in color (similar to the cells to the immediate right). Cells in green are calculated for you.		(Step 1a) If you know the 85th percentile storm event for your location enter it in the box below	(Step 1b) If you can not answer 1a then select the county where the project is located (click on the cell to the right for drop-down): This will determine the average 85th percentile 24 hr. storm event for your site, which will appear under precipitation to left.	*SAN_MATEO*
			(Step 1c) If you would like a more percise value select the location closest to your site. If you do not recgonize any of these locations, leave this drop-down menu at location. The average value for the County will be used.	**SAN FRANCISCO WSO AP**

Project Information		***Runoff Calculations***		
Project Name:	***San Francisquito Creek Flood Reduction, Ecosystem Restoration and Recreation Project***	(Step 2) Indicate the Soil Type (dropdown menu to right):	***Group D Soils***	**Very low infiltration. Clay loam, silty clay loam, sandy clay, silty clay, or clay. Infiltration rate 0 to 0.05 inch/hr when wet.**
Waste Discharge Identification (WDID):	***Optional***	(Step 3) Indicate the existing **dominant** non-built land Use Type (dropdown menu to right):	***Brush: <50% ground cover***	
Date:	***30-Jun-16***	(Step 4) Indicate the proposed **dominant** non-built land Use Type (dropdown menu to right):	***A mix of lawn, grass, pasture and tress covering 50-75% of the open space***	
Sub Drainage Area Name (from map):	***Optional***		**Complete Either**	

Runoff Curve Numbers			Sq Ft	Acres	Acres
Existing Pervious Runoff Curve Number	**98**	*(Step 5) Total Project Site Area:*		**35.00**	**35.00**
Proposed Development Pervious Runoff Curve Number	**98**	*(Step 6) Sub-watershed Area:*		**35.00**	**35.00**
Design Storm		*Percent of total project :*			**100%**

Based on the County you indicated above, we have included the 85 percentile average 24 hr event - P85 (in)^ for your area.	**0.66**	**in**
The Amount of rainfall needed for runoff to occur (Existing runoff curve number -P from existing RCN (in)^)	**0.04**	**In**
P used for calculations (in) (the greater of the above two criteria)	**0.66**	**In**
^Available at www.cabmphandbooks.com		
Pre-Project Runoff Volume (cu ft)	**20,627**	**Cu.Ft.**
Project-Related Runoff Volume Increase w/o credits (cu ft)	**0**	**Cu.Ft.**
Project-Related Volume Increase with Credits (cu ft)	**0**	**Cu.Ft.**

You have achieved your minimum requirements

(Step 7) Sub-watershed Conditions	**Complete Either**		**Calculated Acres**
Sub-watershed Area (acres)	**Sq Ft**	**Acres**	**35.00**
Existing Rooftop Impervious Coverage		**2.5**	**2.50**
Existing Non-Rooftop Impervious Coverage		**32.5**	**32.50**
Proposed Rooftop Impervious Coverage		**3.5**	**3.50**
Proposed Non-Rooftop Impervious Coverage		**31.5**	**31.50**

Credits	**Acres**	**Square Feet**
Porous Pavement	**0.00**	**0**
Tree Planting	**0.00**	**0**
Downspout Disconnection	**0.00**	**0**
Impervious Area Disconnection	**15.75**	**686,070**
Green Roof	**0.00**	**0**
Stream Buffer	**0.00**	**0**
Vegetated Swales	**0.00**	**0**
Subtotal	**15.75**	**686,070**
Subtotal Runoff Volume Reduction Credit	**25293 Cu. Ft.**	

(Step 9) Impervious Volume Reduction Credits	**Volume (cubic feet)**
Rain Barrels/Cisterns	**0 Cu. Ft.**
Soil Quality	**0 Cu. Ft.**
Subtotal Runoff Volume Reduction	**0 Cu. Ft.**
Total Runoff Volume Reduction Credit	**25,293 Cu. Ft.**

Impervious Area Disconnection Credit Worksheet

Please fill out an impervious area disconnection credit worksheet for each project sub-watershed. If you answer yes to all questions, all non-rooftop impervious surface area will be subtracted from your proposed non-rooftop impervious coverage.

Non-Rooftop Disconnection Credit Criteria	Response
Is the maximum contributing impervious flow path length less than 75 feet or, if equal or greater than 75 feet, is a storage device (e.g. French drain, bioretention area, gravel trench) implemented to achieve the required disconnection length?	◉ Yes ○ No
Is the impervious area to any one discharge location less than 5,000 square feet?	◉ Yes ○ No
The Stream Buffer credit **will not** be taken in this sub-watershed area?	◉ Yes ○ No

Percentage of existing	32.50	Acres non-rooftop surface area disconnected	50
Percentage of the proposed	31.50	Acres non-rooftop surface area disconnected	50

Return to Calculator

Attachment G

Maintenance, Inspection, and Repair Program for Construction Site BMPs

MONTGOMERY & ASSOCIATES, INC. 916.476.4903

PRE/WEEKLY/DURING/POST SWPPP INSPECTION FORM MCAS V7.01

DATE 1/0/1900

INSPECTOR NAME, TITLE, & SIGNATURE	DATE OF INSPECTION	TIME OF INSPECTION

PROJECT NAME and SITE ADDRESS		
	Montgomery Job ID / Name	
	PROJECT IDENTIFIER #	
	CONTRACT #	
	PO NUMBER	
	WDID Number	

CONTRACTOR INFORMATION:	PROJECT RISK LEVEL	Current Activities on Site
	☐ Risk Level 1 ☐ Risk Level 2 ☐ Risk Level 3 ☐ ___________	

POC Name		Phone #		E-Mail	

TYPE OF REPORT:	Acres Exposed	Today's Weather	End Date of Previous Rain Event	Total Rain from Previous Rain Event
☐ WEEKLY				

☐ Pre-Storm	Predicted % Chance of Rain & Predicted Amount of Rainfall Per NOAA Forecast in...			Date of NOAA Forecast	
	24hrs %	48hrs %	72hrs %	Time of NOAA forecast	
	Amount	Amount	Amount	Predicted Rain Total	

☐ During Rain ☐ During Rain Event ☐ Sampling	Start Date of Rain Event	Rainfall Amount Today	Amount of Event Rainfall to Date	Qualifying Rain Event? (1/2" +)
				☐ YES ☐ NO
	☐ YES: Sampling done per SAP and recorded on Sampling Log	☐ NO: Water not flowing during inspection	☐ NO: Sampling Exception; see sampling log	

☐ POST Qualifying Rain Event	Start Date of Rain Event	End Date of Rain Event	Total Event Rainfall Per >>	☐ ON-SITE RAIN GAUGE ☐ NOAA

SITE INSPECTION BMP ASSESSMENT	BMP Adequate & Maintained	BMP Needs Maintenance (See Corrective Action Summary Below)	Not Applicable (on this Job at this time)
SS-01: Scheduling *(On-site and in SWPPP, Updated and reflects current operations and site conditions)*			
SS-02: Preserve Existing Vegetation *(Existing growth maintained, and no overgrowth occurring)*			
SS-03: Hydraulic Mulch *(Proper application rate, adequate tackifier, adequate wind/dust control measures)*			
SS-04: Hydro seeding *(Graded to plan, proper application, adequate tackifier, wind/dust control measures)*			
SS-05: Soil Binders *(Properly spread, proper application rate)*			
SS-06: Straw Mulch *(Combo with seed, proper application rate, adequate tackifier)*			
SS-07: Geotextiles/Erosion Control Blankets *(Installed properly, no rips, tacked down functioning properly)*			
SS-08: Wood Mulching *(Installed properly, adequate tackifier)*			
SS-09: Earth Dikes, Drainage Swales & Lined Ditches *(No rips or tears, properly stapled, no erosion visible)*			
SS-10: Velocity Dissipation Devices *(Outlets with continuous flow, discharge points to unlined conveyances)*			
SS-11: Slope Drains *(No rips or tears, properly stapled, no erosion visible)*			
SS-12: Stream bank Stabilization *(No rips or tears, properly stapled, no erosion visible)*			
: RECP Composite Blanket *(No rips or tears, properly stapled, no erosion visible)*			
: Soil Preparation / Roughening / Track-Walking *(Ensure that tracks are horizontal)*			
: Non-Vegetative Stabilization *(Ensure complete coverage, ensure no discharge during installation)*			
SC-01: Silt Fence *(Proper alignment, keyed in , staking secure, no tears, sediment less than 1/3 height)*			
SC-02: Sediment Desilting Basin *(Proper location, shape, size, adequate capacity)*			
SC-03: Sediment Trap *(Ensure no leaks or discharge, adequate capacity)*			
SC-04: Check Dams *(Bags positioned correctly, no degradation or tears, sediment less than 1/3 height)*			
SC-05: Fiber Rolls *(No torn rolls, remove sediment 1/3 the depth of the rolls, properly staked to the ground)*			
SC-06: Gravel Bag Barriers *(Bags positioned correctly, no degradation or tears, sediment less than 1/3 height)*			

PROJECT NAME	WDID NUMBER	0
0	PROJECT IDENTIFIER	0

SITE INSPECTION BMP ASSESSMENT (Continued)	BMP Adequate & Maintained	BMP Needs Maintenance (See Corrective Action Summary Below)	Not Applicable (on this Job at this time)
SC-07: Street Sweeping, Vacuuming, (Inspect streets daily, dispose of sweepings properly off site)			
SC-08: Sandbag Barrier *(Ensure no rips or tears in bags, ensure sediment is under 1/3 of capacity)*			
SC-09: Straw Bale Barrier *(Not used as sediment barrier, or dam. Can be used as barrier protection)*			
SC-10: Storm Drain Inlet Protection *(Filters, no tears. remove sediment, clean regularly)*			
: Active Treatment System *(See specifications and SWPPP for the proper use and documentation of ATS)*			
: Temporary Dike / Berm *(Ensure no holes, or leaks)*			
: Composite / Compost Socks and Berms *(Ensure no rips or tears, properly anchored and trenched, shingled)*			
: Bio filter Bags *(Ensure no holes, tears. Sample discharge if needed).*			
WE-01: Wind Erosion Controls *(Existing wind screens or dust suppressants adequate for nuisance fugitive dust)*			
TC-01: Stabilized Construction Entrance/Exit *(Tracking, maintain rocks / Clean rumble strip, limit access points)*			
TC-02: Stabilized Construction Roadways *(Ensure proper rocks, or strips are used, clean, and less than 1/3 full)*			
TC-03: Entrance-Outlet tire wash *(Ensure limited/forced access. Ensure no discharge from site)*			
TC-04: Street Sweeping/Vacuuming (Clean track-out from site exit daily)			
NS-01: Water Conservation Practices *(Prevent waste of water i.e.. Leaking tanks, trucks, reservoirs, buffalos, hydrants)*			
NS-02: Dewatering Operations *(Inspect per specific guidelines in dewatering plan if implemented)*			
NS-03: Paving & Grinding Operations *(Keep absorbents onsite, equipment on drip protection when not in use, no leaks)*			
NS-04: Temporary Stream Crossing *(Ensure turbid water is tested as needed, ensure testing during removal)*			
NS-05: Clear Water Diversion *(Ensure no potential soil contamination, sample as needed).*			
NS-06: Illicit Connection/Discharge *(No discharge, no employees or subs disposing of non-job related debris)*			
NS-07: Potable Water *(Water tanks not leaking and discharging)*			
NS-08: Vehicle and Equipment Cleaning *(No discharges. Secondary containment, swppp includes this activity)*			
NS-09: Vehicle and Equipment Fueling *(Secondary containment, swpp includes activity, ample spill kits)*			
NS-10: Vehicle and Equipment Maintenance *(Secondary containment, includes this activity, ensure spill kits)*			
NS-11: Pile Driving Operations *(Ensure spill kits, use drip protection, no leaks)*			
NS-12: Concrete Curing *(No overspray, protect inlets, use sediment control, spill kit is available on site)*			
NS-13: Material and Equipment USE *(Ensure drip protection used, effective, and properly disposed)*			
NS-14: Concrete Finishing *(Use secondary containment, no spills, protect inlets, spill kit is available on site)*			
NS-15: Structure Demolition (Proper Removal over or adjacent to water, *no contamination, proper storage)*			
: Temporary Batch Plant *(See specifications and SWPPP for use of batch plant)*			
WM-01: Material Delivery & Storage *(Storage areas clean, list materials on site, inspect labels, repair or replace perimeter controls, containment structures, covers and liners to maintain proper function)*			
WM-02: Material Use *(Ensure employees are trained in appropriate practices, and storage of materials)*			
WM-03: Stockpile Management (Full coverage, repair/replace perimeter controls, cover controls)			
WM-04: Spill Prevention & Control *(Proper spill kits, inspect for non-storm water discharges)*			
WM-05: Solid Waste Management *(No non-storm water discharges, mark waste bins, cover bins or waste piles daily, arrange for regular waste collection, ensure use of proper waste facilities,*			
WM-06: Hazardous Waste Management *(Stored in secondary, properly labeled, held for less than 90 days)*			
WM-07: Contaminated Soil Management *(Stored in container marked "impacted soil", properly disposed)*			
WM-08: Concrete Waste Management *(PCC waste bin adequate capacity, no leaks, labeled, clean up debris)*			
WM-09: Sanitary/Septic Waste Management *(Properly located, away from creeks, drains, inlets, regular maintenance, secondary containment, tied down, clean up all spills)*			
WM-10: Liquid Waste Management *(Secondary containment, covered, away from water bodies)*			
Project Specific Item:			

DATE: 0-Jan-00

SWPPP SITE INSPECTION CORRECTIVE ACTIONS

PROJECT NAME	WDID NUMBER	0
0	PROJECT IDENTIFIER	0

Corrective Action date / number	Implement actions identified in storm water site inspection report as soon as possible. Corrective actions must Initiate within 72 hours of the site inspection per plan .		
	BMP Type		Location
	Required Action		Comments
	Date Completed or Verified	Verified by (Print Name)	Verified by (signature)
	BMP Type		Location
	Required Action		Comments
	Date Completed or Verified	Verified by (Print Name)	Verified by (signature)
	BMP Type		Location
	Required Action		Comments
	Date Completed or Verified	Verified by (Print Name)	Verified by (signature)
	BMP Type		Location
	Required Action		Comments
	Date Completed or Verified	Verified by (Print Name)	Verified by (signature)
	BMP Type		Location
	Required Action		Comments
	Date Completed or Verified	Verified by (Print Name)	Verified by (signature)
	BMP Type		Location
	Required Action		Comments
	Date Completed or Verified	Verified by (Print Name)	Verified by (signature)
	BMP Type		Location
	Required Action		Comments
	Date Completed or Verified	Verified by (Print Name)	Verified by (signature)
	BMP Type		Location
	Required Action		Comments
	Date Completed or Verified	Verified by (Print Name)	Verified by (signature)
	BMP Type		Location
	Required Action		Comments
	Date Completed or Verified	Verified by (Print Name)	Verified by (signature)
	BMP Type		Location
	Required Action		Comments
	Date Completed or Verified	Verified by (Print Name)	Verified by (signature)

Storm Water Site Inspection Report Corrective Action Summary

PROJECT INFORMATION NAME AND SITE ADDRESS		
0	WDID NUMBER	0
0	PROJECT IDENTIFIER	0
0	CONTRACT #/CO/RTE/PM	0
0	Montgomery Job ID	0
	PO NUMBER	0

DAILY RAINFALL LOG		Start date and time				End Date and Time		
DATE:	Amount	DATE:	Amount	DATE:	Amount	DATE:	Amount	Rain log amounts Per ☐ NOAA ☐ RAIN GAUGE
1/1/2016	.00"							
								Total Rain at end of this event

COMMENTS SECTION: (Special Notes about this project site)

List observations regarding algae blooms in channel:

DOES THE SWPPP NEED TO BE AMENDED? ☐ NO ☐ YES (If Yes , please describe below)

SWPPP concerns not addressed by this form ? ☐ NO ☐ YES (if Yes, explain Below)

Storm Water Site Inspection Report Corrective Action Summary Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the people who manage the system or are directly responsible for gathering the information, the information submitted is true, accurate, and complete to the best of my knowledge and belief. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment or knowing violations.

QSP Name (Printed)		DATE	1/0/1900
QSP Signature			

Storm Water Site Inspection Report Corrective Action Summary Acceptance:

Resident Engineer name (Printed)		DATE	
Resident Engineer signature			

Attachment H

Storm Water Quality Inspection Check Lists & Inspection Log

MONTGOMERY & ASSOCIATES, INC.

QUARTERLY INSPECTION FORM

Conduct one visual inspection quarterly in each of the following periods January-March, April-June, July-September, and October-December.

PROJECT INFORMATION NAME AND SITE ADDRESS	CONTRACT NUMBER/CO/RTE/PM
0 0 0 0	0 PROJECT IDENTIFIER NUMBER 0 WDID NUMBER 0
CONTRACTOR NAME AND ADDRESS	PROJECT RISK LEVEL
0 0 0	☐ Risk Level 1 ☐ Risk Level 2 ☐ Risk Level 3

Submitted by contractor (print and sign name)	Date
	0-Jan-00

QSD name and company name	Phone Number
0	
	Emergency (24/7) phone number

Inspector's Name	Date of Inspection
0	1/0/1900

Weather Conditions	Precipitation Condition			Wind Condition
☐ Clear	☐ Misty	☐ Heavy Rain	☐ None	☐ None
☐ Partly Cloudy	☐ Light Rain	☐ Hail		☐ Less than 5
☐ Cloudy	☐ Rain	☐ Snow		☐ Greater than 5

Construction Phase	Site Information
☐ Highway construction	____ Acres total project area
☐ Plant established	____ Acres total project disturbed soil area
☐ Suspension of work (inactive site)	____ Acres current phase disturbed soil area
	____ Acres current phase inactive disturbed soil

Time elapsed since last storm ____ days | Precipitation amount from last storm ____ inches

Drainage Areas	Presence of a non-stormwater discharge?		Indication of a prior non-stormwater discharge?		Date discharge was observed	Photos?	Source of non-stormwater discharge and required actions.	Action No.
	Yes	No	Yes	No		Yes		
Location								
Location								
Location								
Location								
Location								

Drainage Areas *If any water is retained or stored, report the following.*	Presence of floating and suspended materials (algae blooms)?		Presence of discoloration or turbidity?		Presence of odors?		Sample Taken? *		Comments and required actions	Action No.
	Yes	No	Yes	No	Yes	No	Yes	No		
Location										
Location										
Location										
Location										
Location										

DATE 0-Jan-00

PROJECT INFORMATION NAME AND SITE ADDRESS	CONTRACT NUMBER/CO/RTE/PM
0	0
0	PROJECT IDENTIFIER NUMBER
0	0
0	WDID NUMBER
0	0

* Sample non-stormwater discharge at the location where the discharge leaves the jobsite and record location under drainage discharge locations.

Drainage Discharge Locations	Presence of a non-stormwater discharge?		Indication of a prior non-stormwater discharge?		Date discharge was observed	Photos?	Source of non-stormwater discharge and required actions.	Action No.
	Yes	No	Yes	No		Yes		
Location								
Location								
Location								
Location								
Location								

Drainage Discharge Locations *IF any water is flowing, report the following:*	Presence of floating and suspended materials?		Presence of discoloration or turbidity?		Presence of odors?		Discharge sample taken?		Run-On Sample Taken?		Photos?
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Location											
Location											
Location											
Location											
Location											

RISK LEVEL 3 - Drainage Discharge *IF any water is flowing, report the following:*			Upstream or un-gradient receiving water sample taken?		Downstream or downgradient receiving water sample taken?		Comments
	Yes	No	Yes	No	Yes	No	
Location							
Location							
Location							
Location							
Location							

Illegal Connection or Discharge Detection *Observe the jobsite and jobsite perimeter for illegal connections and discharges.*	Evidence of illegal connection?		Illegal discharges on jobsite?		Engineer notified of illegal connection or discharge?		Photos?	Comments and required actions	Action No.
	Yes	No	Yes	No			Yes		
Location									
Location									
Location									
Location									
Location									

DATE 0-Jan-00

PROJECT INFORMATION NAME AND SITE ADDRESS	CONTRACT NUMBER/CO/RTE/PM
0	0
0	PROJECT IDENTIFIER NUMBER
0	0
0	WDID NUMBER
0	0

Were samples taken? ☐ YES ☐ NO

Will there be a Notice of Discharge Filed? ☐ YES ☐ NO

COMMENTS:

Stormwater Inspection Report Certification

I certify under penalty of law that this Stormwater Inspection Report was performed in accordance with the General Permit. The information contained in this inspection report was gathered from a field site inspection. I am aware that section 309 (c)(4) of the Clean Water Act provides for significant penalties, including fines and imprisonment for knowingly submitting false material statement, representation or certification.

Stormwater Inspector Name	Date Report Completed
0	0-Jan-00

Stormwater Inspector Signature

I certify under penalty of law that this Stormwater Inspection Report was performed in accordance with the General Permit by me or under my direction or supervision. The information contained in this inspection report was gathered and evaluated by qualified personnel prior to submittal. Based on my review of the information and inquiry of those who gathered and evaluated the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

I am aware that Section 309 (c)(4) of the Clean Water Act provides for significant penalties, including fines and imprisonment for knowingly submitting false material statement, representation, or certification.

QSD Name	Date
0	0-Jan-00

QSD Signature

Stormwater Inspection Report Acceptance

Accepted by Resident Engineer (Name)	Date

Resident Engineer Signature

Attachment I

Contractor Training Log & QSD/QSP Credentials

Location: ______________________ **Date:** ______________________

Instructor: ______________________ **Telephone:** ______________________

Course Length (hours): ______________________

Storm Water Management Topic: (check as appropriate)

- ❑ Erosion Control
- ❑ Sediment Control
- ❑ Wind Erosion Control
- ❑ Tracking Control
- ❑ Non-Storm Water Management
- ❑ Waste Management and Materials Pollution Control
- ❑ Storm Water Sampling

Specific Training Objective: ____

Comments:

____

____

____

____

____

See attached Sheet for attendees

ATTENDEE ROSTER		
NAME	**COMPANY**	**PHONE**

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP DEVELOPER (QSD)
AND
QUALIFIED SWPPP PRACTITIONER (QSP)

Scott Berkebile

Jan 27, 2015 - Feb 16, 2017

Certificate # 00335

CASQA
CALIFORNIA STORMWATER
QUALITY ASSOCIATION®

California Stormwater Quality Association and
California Construction General Permit Training Team

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP PRACTITIONER (QSP)

Doug Wathen

Jul 12, 2015 - Sep 08, 2017

Certificate # 00461

CASQA

CALIFORNIA STORMWATER QUALITY ASSOCIATION®

California Stormwater Quality Association and California Construction General Permit Training Team

CERTIFICATE OF TRAINING

CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP DEVELOPER (QSD)
AND
QUALIFIED SWPPP PRACTITIONER (QSP)

Michael Wathen

Feb 18, 2015 - Mar 10, 2017

Certificate # 00413

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION®

California Stormwater Quality Association and
California Construction General Permit Training Team

Attachment J

Subcontractor Notification Letter and Notification Log

SWPPP Notification

Company
Address
City, State, ZIP

Dear Sir/Madam,

Please be advised that the California State Water Resources Control Board has adopted the 2012-0006-DWQ General Permit (General Permit) for Storm Water Discharges Associated with Construction Activity (CAS000002). The goal of these permits is prevent the discharge of pollutants associated with construction activity from entering the storm drain system, ground and surface waters.

Teichert Construction has developed a Storm Water Pollution Prevention Plan (SWPPP) in order to implement the requirements of the San Francisquito Creek Flood Reduction, Ecosystem Restoration and Recreation Project.

As a contractor/subcontractor, you are required to comply with the SWPPP and the Permits for any work that you perform on site. Any person or group who violates any condition of the Permits may be subject to substantial penalties in accordance with state and federal law. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP and the Permits. A copy of the Permits and the SWPPP are available for your review at the construction office. Please contact me if you have further questions.

Sincerely,

____
Project Manager

SUBCONTRACTOR NOTIFICATION LOG					
COMPANY	**ADDRESS**	**TRADE**	**CONTACT PERSON**	**PHONE NUMBERS**	**DATE LETTER SENT**

Attachment K

Risk Assessment & Project Schedule

Calculated Risk Level

Risk Assessment based on a project schedule from July 25, 2016 - Dec 31, 2018
and a lat/long of (37.453134, -122.127604)

Total R- Factor = 96.32

Proof:
Project Isoerodent is 40.
Project is scheduled to begin July 25, 2016 and is scheduled to end December 31, 2018.
From July 25, 2016 - December 31, 2016 the EI Percentage is 40.8 (100.0 - 59.2 = 40.8)
From January 1, 2017 - December 31, 2017 the EI Percentage is 100.0
From January 1, 2018 - December 31, 2018 the EI Percentage is 100.0
,
2016 R Factor = 40 * (0.408) = 16.32
2017 R Factor = 40 * 1.000 = 40.00
2018 R Factor = 40 * 1.000 = 40.00
Total R Factor for the duration of the project = 16.32 + 40.00 + 40.00 = 96.32

LS Factor = 0.36

K Factor = 0.32

Using RUSLE: R * K * LS * C * P
96.32 * 0.32* 0.36 * 1 * 1 = 11.09 tons/acre for the project = Low sediment risk

The Project lies within a High Risk Receiving Watershed.
Low Sediment Risk and High Risk Receiving Watershed Risk mean that the project is a

Risk Level 2 Project

Figure 1. Erosivity Index Zone Map

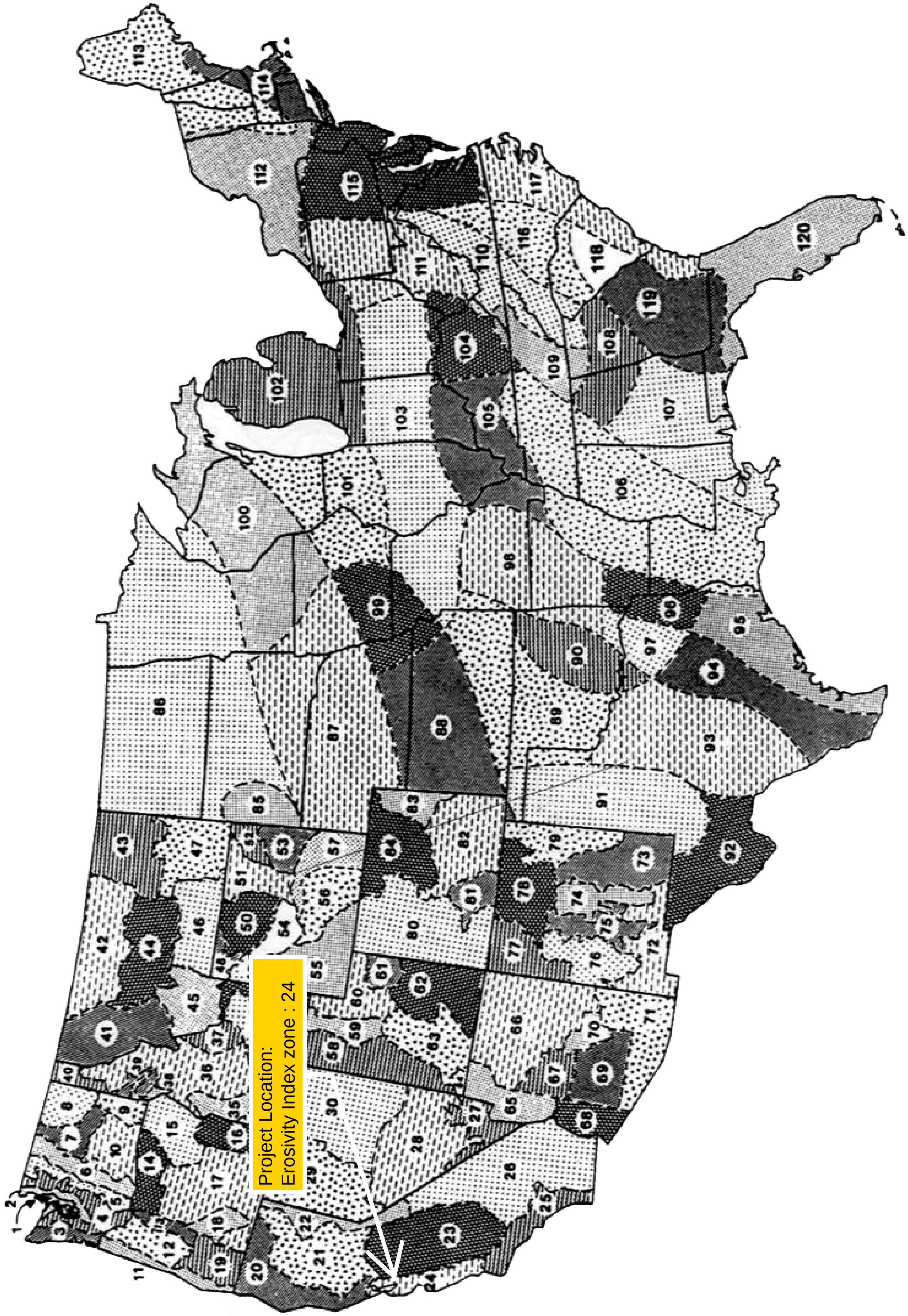
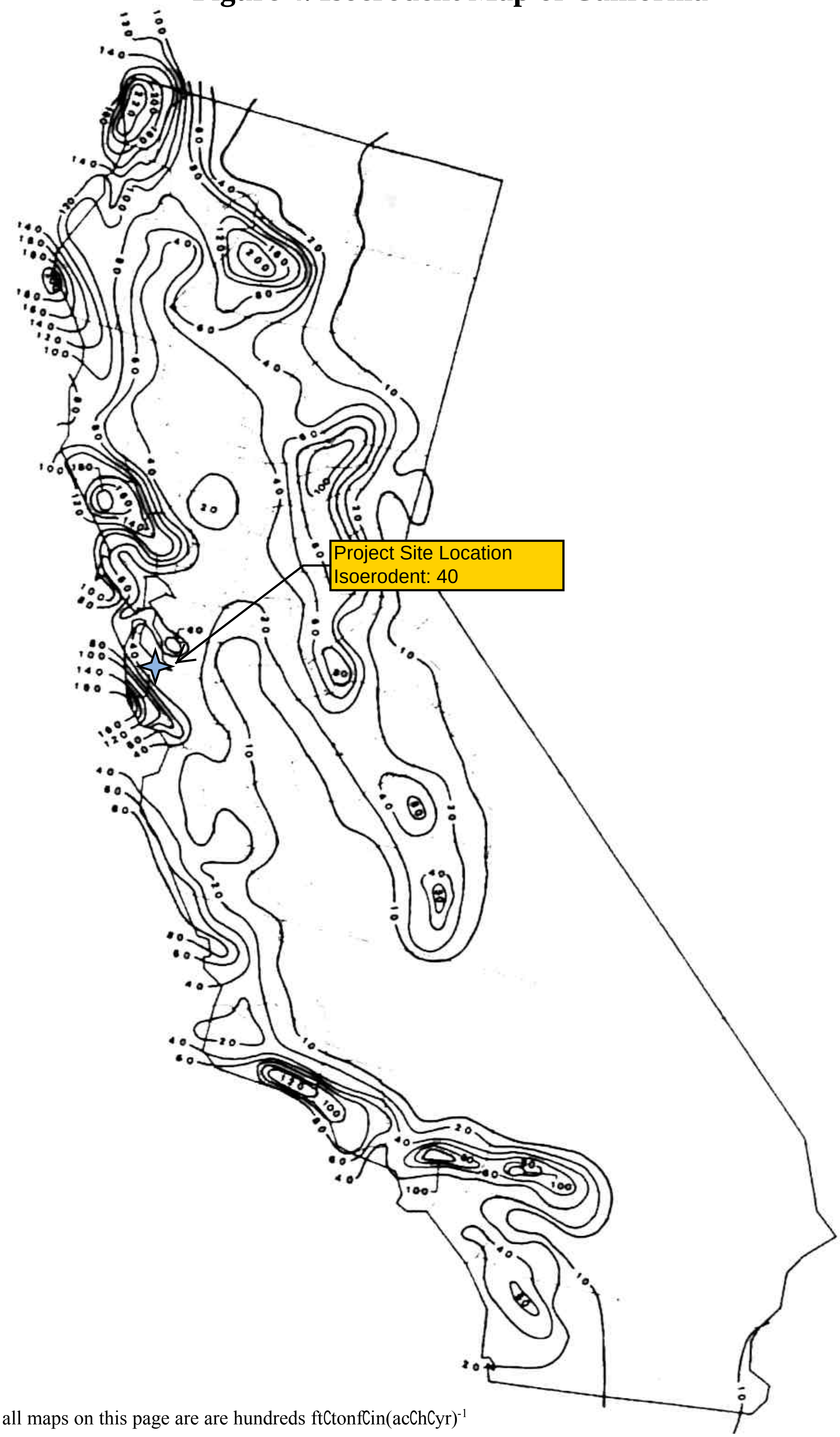


Figure 4. Isoerodent Map of California



Note: Units for all maps on this page are are hundreds ftCtonfCin(acChCyr)$^{-1}$

Table 1. Erosivity Index (%EI Values extracted from USDA Manual 703)

All values are at the end of the day listed below - Linear interpolation between dates is acceptable.
EI as a percentage of Average Annual R Value Computed for Geographic Areas Shown in Figure 1

Month	Jan	Jan	Jan	Feb	Mar	Mar	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Jul	Aug	Aug	Sept	Sept	Oct	Oct	Nov	Nov	Dec	Dec
Day	1	16	31	15	1	16	31	15	30	15	30	14	29	14	29	13	28	12	27	12	27	11	26	11	31
EI Zone																									
1	0	4.3	8.3	12.8	17.3	21.6	25.1	28	30.9	34.9	39.1	42.6	45.4	48.2	50.8	53	56	60.8	66.8	71	75.7	82	89.1	95.2	100
2	0	4.3	8.3	12.8	17.3	21.6	25.1	28.0	30.9	34.9	39.1	42.6	45.4	48.2	50.8	53.0	56.0	60.8	66.8	71.0	75.7	82.0	89.1	95.2	100
3	0	7.4	13.8	20.9	26.5	31.8	35.3	38.5	40.2	41.6	42.5	43.6	44.5	45.1	45.7	46.4	47.7	49.4	52.8	57.0	64.5	73.1	83.3	92.3	100
4	0	3.9	7.9	12.6	17.4	21.6	25.2	28.7	31.9	35.1	38.2	42.0	44.9	46.7	48.2	50.1	53.1	56.6	62.2	67.9	75.2	83.5	90.5	96.0	100
5	0	2.3	3.6	4.7	6.0	7.7	10.7	13.9	17.8	21.2	24.5	28.1	31.1	33.1	35.3	38.2	43.2	48.7	57.3	67.8	77.9	86.0	91.3	96.9	100
6	0	0.0	0.0	0.5	2.0	4.1	8.1	12.6	17.6	21.6	25.5	29.6	34.5	40.0	45.7	50.7	55.6	60.2	66.5	75.5	85.6	95.9	99.5	99.9	100
7	0	0.0	0.0	0.0	0.0	1.2	4.9	8.5	13.9	19.0	26.0	35.4	43.9	48.8	53.9	64.5	73.4	77.5	80.4	84.8	89.9	96.6	99.2	99.7	100
8	0	0.0	0.0	0.0	0.0	0.9	3.6	7.8	15.0	20.2	27.4	38.1	49.8	57.9	65.0	75.6	82.7	86.8	89.4	93.4	96.3	99.1	100.0	100.0	100
9	0	0.8	3.1	4.7	7.4	11.7	17.8	22.5	27.0	31.4	36.0	41.6	46.4	50.1	53.4	57.4	61.7	64.9	69.7	79.0	89.6	97.4	100.0	100.0	100
10	0	0.3	0.5	0.9	2.0	4.3	9.2	13.1	18.0	22.7	29.2	39.5	46.3	48.8	51.1	57.2	64.4	67.7	71.1	77.2	85.1	92.5	96.5	99.0	100
11	0	5.4	11.3	18.8	26.3	33.2	37.4	40.7	42.5	44.3	45.4	46.5	47.1	47.4	47.8	48.3	49.4	50.7	53.6	57.5	65.5	76.2	87.4	94.8	100
12	0	3.5	7.8	14.0	21.1	27.4	31.5	35.0	37.3	39.8	41.9	44.3	45.6	46.3	46.8	47.9	50.0	52.9	57.9	62.3	69.3	81.3	91.5	96.7	100
13	0	0.0	0.0	1.8	7.2	11.9	16.7	19.7	24.0	31.2	42.4	55.0	60.0	60.8	61.2	62.6	65.3	67.6	71.6	76.1	83.1	93.3	98.2	99.6	100
14	0	0.7	1.8	3.3	6.9	16.5	26.6	29.9	32.0	35.4	40.2	45.1	51.9	61.1	67.5	70.7	72.8	75.4	78.6	81.9	86.4	93.6	97.7	99.3	100
15	0	0.0	0.0	0.5	2.0	4.4	8.7	12.0	16.6	21.4	29.7	44.5	56.0	60.8	63.9	69.1	74.5	79.1	83.1	87.0	90.9	96.6	99.1	99.8	100
16	0	0.0	0.0	0.5	2.0	5.5	12.3	16.2	20.9	26.4	35.2	48.1	58.1	63.1	66.5	71.9	77.0	81.6	85.1	88.4	91.5	96.3	98.7	99.6	100
17	0	0.0	0.0	0.7	2.8	6.1	10.7	12.9	16.1	21.9	32.8	45.9	55.5	60.3	64.0	71.2	77.2	80.3	83.1	87.7	92.6	97.2	99.1	99.8	100
18	0	0.0	0.0	0.6	2.5	6.2	12.4	16.4	20.2	23.9	29.3	37.7	45.6	49.8	53.3	58.4	64.3	69.0	75.0	86.6	93.9	96.6	98.0	100.0	100
19	0	1.0	2.6	7.4	16.4	23.5	28.0	31.0	33.5	37.0	41.7	48.1	51.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	61.1	65.8	74.7	88.0	95.8	98.7	100
20	0	9.8	18.5	25.4	30.2	35.6	38.9	41.5	42.9	44.0	45.2	48.2	50.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	60.1	63.2	69.6	76.7	85.4	92.4	100
21	0	7.5	13.6	18.1	21.1	24.4	27.0	29.4	31.7	34.6	37.3	39.6	41.6	43.4	45.4	48.1	51.3	53.3	56.6	62.4	72.4	81.3	88.9	94.7	100
22	0	1.2	1.6	1.6	1.6	1.6	1.6	2.2	3.9	4.6	6.4	14.2	32.8	47.2	58.8	69.1	76.0	82.0	87.1	96.7	99.9	99.9	99.9	99.9	100
23	0	7.9	15.0	20.9	25.7	31.1	35.7	40.2	43.2	46.2	47.7	48.8	49.4	49.9	50.7	51.8	54.1	57.7	62.8	65.9	70.1	77.3	86.8	93.5	100
24	0	12.2	23.6	33.0	39.7	47.1	51.7	55.9	57.7	58.6	58.9	59.1	59.1	59.2	59.2	59.3	59.5	60.0	61.4	63.0	66.5	71.8	81.3	89.6	100
25	0	9.8	20.8	30.2	37.6	45.8	50.6	54.4	56.0	56.8	57.1	57.1	57.2	57.6	58.5	59.8	62.2	65.3	67.5	68.2	69.4	74.8	86.6	93.0	100
26	0	2.0	5.4	9.8	15.6	21.5	24.7	26.6	27.4	28.0	28.7	29.8	32.5	36.6	44.9	55.4	65.7	72.6	77.8	84.4	89.5	93.9	96.5	98.4	100
27	0	0.0	0.0	1.0	4.0	5.9	8.0	11.1	13.0	14.0	14.6	15.3	17.0	23.2	39.1	60.0	76.3	86.1	89.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	100
28	0	0.0	0.0	0.0	0.2	0.5	1.5	3.3	7.2	11.9	17.7	21.4	27.0	37.1	51.4	62.3	70.6	78.8	84.6	90.6	94.4	97.9	99.3	100.0	100
29	0	0.6	0.7	0.7	0.7	1.5	3.9	6.0	10.5	17.9	28.8	36.6	43.8	51.5	59.3	68.0	74.8	80.3	84.3	88.8	92.7	98.0	99.8	99.9	100
30	0	0.0	0.0	0.0	0.0	0.2	0.8	2.8	7.9	14.2	24.7	35.6	45.4	52.2	58.7	68.5	77.6	84.5	88.9	93.7	96.2	97.6	98.3	99.6	100
31	0	0.0	0.0	0.0	0.0	0.2	1.0	3.5	9.9	15.7	26.4	47.2	61.4	65.9	69.0	77.2	86.0	91.6	94.8	98.7	100.0	100.0	100.0	100.0	100
32	0	0.1	0.1	0.1	0.1	0.6	2.2	4.3	9.0	14.2	23.3	34.6	46.3	54.2	61.7	72.9	82.5	89.6	93.7	98.2	99.7	99.9	99.9	99.9	100
33	0	0.0	0.0	0.0	0.0	0.6	2.3	4.2	8.8	16.1	30.0	46.9	57.9	62.8	66.2	72.1	79.1	85.9	91.1	97.0	98.9	98.9	98.9	98.9	100
34	0	0.0	0.0	0.0	0.0	1.8	7.3	10.7	15.5	22.0	29.9	35.9	42.0	48.5	56.9	67.0	76.9	85.8	91.2	95.7	97.8	99.6	100.0	100.0	100
35	0	0.0	0.0	0.0	0.0	2.5	10.2	15.9	22.2	27.9	34.7	43.9	51.9	56.9	61.3	67.3	73.9	80.1	85.1	89.6	93.2	98.2	99.8	99.8	100

START DATE JULY 25, 2016

END DATE DEC 31, 2018

Attachment L

Annual Report & Certification

Annual Report Certification by Legally Responsible Person

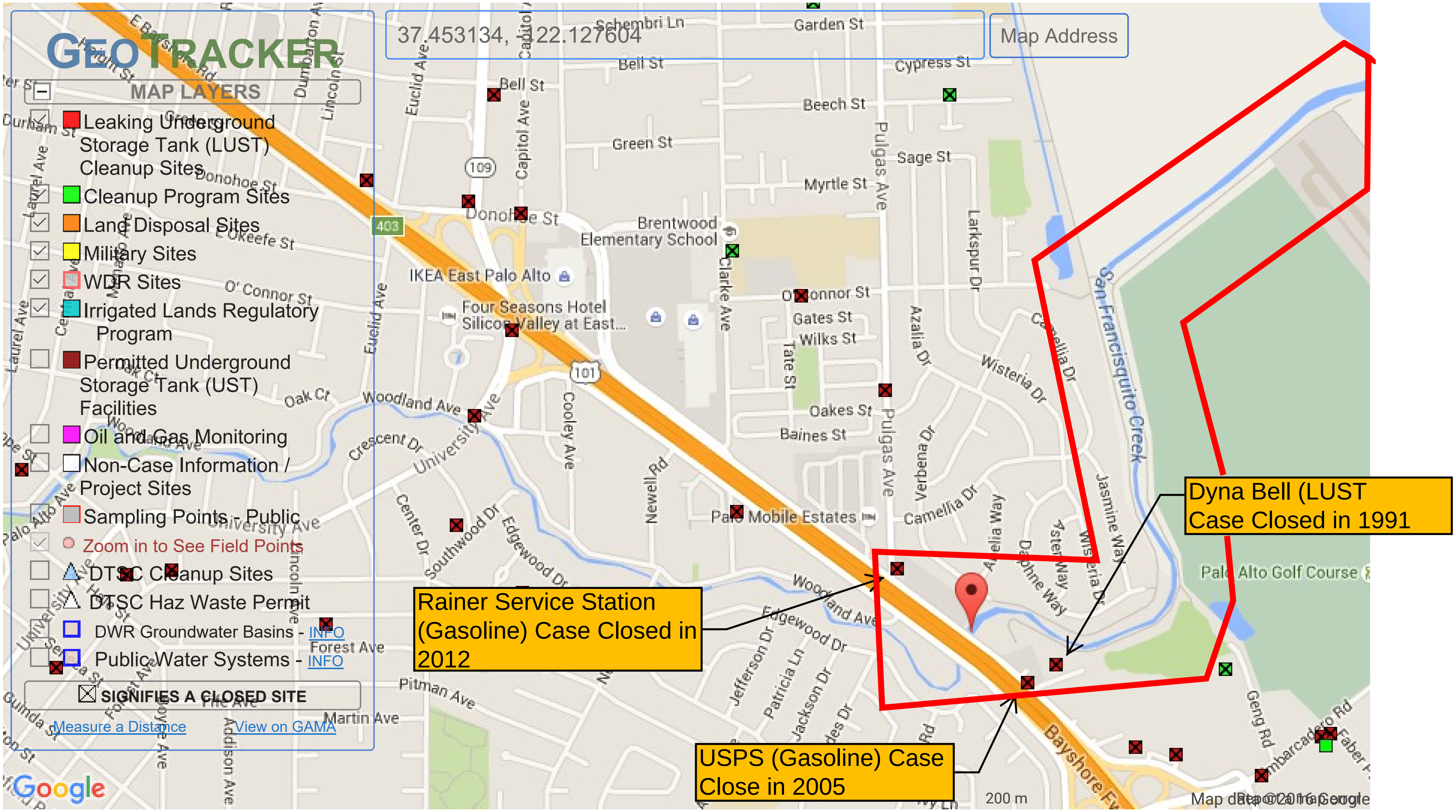
This Certification must be included in the Annual Report

"I certify under a penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility

Legally Responsible Person	Date
Name and Title	Phone Number

Attachment M

Other Plans and Permits



Map of Historic Contamination According to the SWRCB's Geotracker Website
(within 1,000 feet of the project)

1,000 foot radius from project

ATTACHMENT D
RISK LEVEL 2 REQUIREMENTS

A. Effluent Standards

[These requirements are the same as those in the General Permit order.]

1. <u>Narrative</u> – Risk Level 2 dischargers shall comply with the narrative effluent standards listed below:

   a. Storm water discharges and authorized non-storm water discharges regulated by this General Permit shall not contain a hazardous substance equal to or in excess of reportable quantities established in 40 C.F.R. §§ 117.3 and 302.4, unless a separate NPDES Permit has been issued to regulate those discharges.

   b. Dischargers shall minimize or prevent pollutants in storm water discharges and authorized non-storm water discharges through the use of controls, structures, and management practices that achieve BAT for toxic and non-conventional pollutants and BCT for conventional pollutants.

2. <u>Numeric</u> – Risk level 2 dischargers are subject to a pH NAL of 6.5-8.5, and a turbidity NAL of 250 NTU.

B. Good Site Management "Housekeeping"

1. Risk Level 2 dischargers shall implement good site management (i.e., "housekeeping") measures for <u>construction materials</u> that could potentially be a threat to water quality if discharged. At a minimum, Risk Level 2 dischargers shall implement the following good housekeeping measures:

   a. Conduct an inventory of the products used and/or expected to be used and the end products that are produced and/or expected to be produced. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

   b. Cover and berm loose stockpiled construction materials that are not actively being used (i.e. soil, spoils, aggregate, fly-ash, stucco, hydrated lime, etc.).

c. Store chemicals in watertight containers (with appropriate secondary containment to prevent any spillage or leakage) or in a storage shed (completely enclosed).

d. Minimize exposure of construction materials to precipitation. This does not include materials and equipment that are designed to be outdoors and exposed to environmental conditions (i.e. poles, equipment pads, cabinets, conductors, insulators, bricks, etc.).

e. Implement BMPs to prevent the off-site tracking of loose construction and landscape materials.

2. Risk Level 2 dischargers shall implement good housekeeping measures for <u>waste management</u>, which, at a minimum, shall consist of the following:

   a. Prevent disposal of any rinse or wash waters or materials on impervious or pervious site surfaces or into the storm drain system.

   b. Ensure the containment of sanitation facilities (e.g., portable toilets) to prevent discharges of pollutants to the storm water drainage system or receiving water.

   c. Clean or replace sanitation facilities and inspecting them regularly for leaks and spills.

   d. Cover waste disposal containers at the end of every business day and during a rain event.

   e. Prevent discharges from waste disposal containers to the storm water drainage system or receiving water.

   f. Contain and securely protect stockpiled waste material from wind and rain at all times unless actively being used.

   g. Implement procedures that effectively address hazardous and non-hazardous spills.

   h. Develop a spill response and implementation element of the SWPPP prior to commencement of construction activities. The SWPPP shall require:

      i. Equipment and materials for cleanup of spills shall be available on site and that spills and leaks shall be cleaned up immediately and disposed of properly.

ii. Appropriate spill response personnel are assigned and trained.

i. Ensure the containment of concrete washout areas and other washout areas that may contain additional pollutants so there is no discharge into the underlying soil and onto the surrounding areas.

3. Risk Level 2 dischargers shall implement good housekeeping for vehicle storage and maintenance, which, at a minimum, shall consist of the following:

   a. Prevent oil, grease, or fuel to leak in to the ground, storm drains or surface waters.

   b. Place all equipment or vehicles, which are to be fueled, maintained and stored in a designated area fitted with appropriate BMPs.

   c. Clean leaks immediately and disposing of leaked materials properly.

4. Risk Level 2 dischargers shall implement good housekeeping for landscape materials, which, at a minimum, shall consist of the following:

   a. Contain stockpiled materials such as mulches and topsoil when they are not actively being used.

   b. Contain all fertilizers and other landscape materials when they are not actively being used.

   c. Discontinue the application of any erodible landscape material within 2 days before a forecasted rain event or during periods of precipitation.

   d. Apply erodible landscape material at quantities and application rates according to manufacture recommendations or based on written specifications by knowledgeable and experienced field personnel.

   e. Stack erodible landscape material on pallets and covering or storing such materials when not being used or applied.

5. Risk Level 2 dischargers shall conduct an assessment and create a list of potential pollutant sources and identify any areas of the site where additional BMPs are necessary to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges. This potential pollutant list shall be kept with the SWPPP and shall identify

all non-visible pollutants which are known, or should be known, to occur on the construction site. At a minimum, when developing BMPs, Risk Level 2 dischargers shall do the following:

a. Consider the quantity, physical characteristics (e.g., liquid, powder, solid), and locations of each potential pollutant source handled, produced, stored, recycled, or disposed of at the site.

b. Consider the degree to which pollutants associated with those materials may be exposed to and mobilized by contact with storm water.

c. Consider the direct and indirect pathways that pollutants may be exposed to storm water or authorized non-storm water discharges. This shall include an assessment of past spills or leaks, non-storm water discharges, and discharges from adjoining areas.

d. Ensure retention of sampling, visual observation, and inspection records.

e. Ensure effectiveness of existing BMPs to reduce or prevent pollutants in storm water discharges and authorized non-storm water discharges.

6. Risk Level 2 dischargers shall implement good housekeeping measures on the construction site to control the air deposition of site materials and from site operations. Such particulates can include, but are not limited to, sediment, nutrients, trash, metals, bacteria, oil and grease and organics.

7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall document all housekeeping BMPs in the SWPPP and REAP(s) in accordance with the nature and phase of the construction project. Construction phases at traditional land development projects include Grading and Land Development Phase, Streets and Utilities, or Vertical Construction for traditional land development projects.

C. Non-Storm Water Management

1. Risk Level 2 dischargers shall implement measures to control all non-storm water discharges during construction.

2. Risk Level 2 dischargers shall wash vehicles in such a manner as to prevent non-storm water discharges to surface waters or MS4 drainage systems.

3. Risk Level 2 dischargers shall clean streets in such a manner as to prevent unauthorized non-storm water discharges from reaching surface water or MS4 drainage systems.

D. Erosion Control

1. Risk Level 2 dischargers shall implement effective wind erosion control.

2. Risk Level 2 dischargers shall provide effective soil cover for inactive[1] areas and all finished slopes, open space, utility backfill, and completed lots.

3. Risk Level 2 dischargers shall limit the use of plastic materials when more sustainable, environmentally friendly alternatives exist. Where plastic materials are deemed necessary, the discharger shall consider the use of plastic materials resistant to solar degradation.

E. Sediment Controls

1. Risk Level 2 dischargers shall establish and maintain effective perimeter controls and stabilize all construction entrances and exits to sufficiently control erosion and sediment discharges from the site.

2. On sites where sediment basins are to be used, Risk Level 2 dischargers shall, at minimum, design sediment basins according to the method provided in CASQA's Construction BMP Guidance Handbook.

3. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall implement appropriate erosion control BMPs (runoff control and soil stabilization) in conjunction with sediment control BMPs for areas under active[2] construction.

4. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths[3] in accordance with Table 1.

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[1] Inactive areas of construction are areas of construction activity that have been disturbed and are not scheduled to be re-disturbed for at least 14 days.
[2] Active areas of construction are areas undergoing land surface disturbance. This includes construction activity during the preliminary stage, mass grading stage, streets and utilities stage and the vertical construction stage.
[3] Sheet flow length is the length that shallow, low velocity flow travels across a site.

Table 1 - Critical Slope/Sheet Flow Length Combinations

Slope Percentage	Sheet flow length not to exceed
0-25%	20 feet
25-50%	15 feet
Over 50%	10 feet

5. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that construction activity traffic to and from the project is limited to entrances and exits that employ effective controls to prevent offsite tracking of sediment.

6. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall ensure that all storm drain inlets and perimeter controls, runoff control BMPs, and pollutant controls at entrances and exits (e.g. tire washoff locations) are maintained and protected from activities that reduce their effectiveness.

7. **Additional Risk Level 2 Requirement:** Risk Level 2 dischargers shall inspect on a daily basis all immediate access roads daily. At a minimum daily (when necessary) and prior to any rain event, the discharger shall remove any sediment or other construction activity-related materials that are deposited on the roads (by vacuuming or sweeping).

F. Run-on and Run-off Controls

Risk Level 2 dischargers shall effectively manage all run-on, all runoff within the site and all runoff that discharges off the site. Run-on from off site shall be directed away from all disturbed areas or shall collectively be in compliance with the effluent limitations in this General Permit.

G. Inspection, Maintenance and Repair

1. Risk Level 2 dischargers shall ensure that all inspection, maintenance repair and sampling activities at the project location shall be performed or supervised by a Qualified SWPPP Practitioner (QSP) representing the discharger. The QSP may delegate any or all of these activities to an employee appropriately trained to do the task(s).

2. Risk Level 2 dischargers shall perform weekly inspections and observations, and at least once each 24-hour period during extended storm events, to identify and record BMPs that need maintenance to operate effectively, that have failed, or that could fail to operate as intended. Inspectors shall be the QSP or be trained by the QSP.

3. Upon identifying failures or other shortcomings, as directed by the QSP, Risk Level 2 dischargers shall begin implementing repairs or design changes to BMPs within 72 hours of identification and complete the changes as soon as possible.

4. For each inspection required, Risk Level 2 dischargers shall complete an inspection checklist, using a form provided by the State Water Board or Regional Water Board or in an alternative format.

5. Risk Level 2 dischargers shall ensure that checklists shall remain onsite with the SWPPP and at a minimum, shall include:

   a. Inspection date and date the inspection report was written.

   b. Weather information, including presence or absence of precipitation, estimate of beginning of qualifying storm event, duration of event, time elapsed since last storm, and approximate amount of rainfall in inches.

   c. Site information, including stage of construction, activities completed, and approximate area of the site exposed.

   d. A description of any BMPs evaluated and any deficiencies noted.

   e. If the construction site is safely accessible during inclement weather, list the observations of all BMPs: erosion controls, sediment controls, chemical and waste controls, and non-storm water controls. Otherwise, list the results of visual inspections at all relevant outfalls, discharge points, downstream locations and any projected maintenance activities.

   f. Report the presence of noticeable odors or of any visible sheen on the surface of any discharges.

   g. Any corrective actions required, including any necessary changes to the SWPPP and the associated implementation dates.

   h. Photographs taken during the inspection, if any.

   i. Inspector’s name, title, and signature.

H. Rain Event Action Plan

1. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop a Rain Event Action Plan (REAP) 48 hours prior to any

likely precipitation event. A likely precipitation event is any weather pattern that is forecast to have a 50% or greater probability of producing precipitation in the project area. The discharger shall ensure a QSP obtain a printed copy of precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the project's location at http://www.srh.noaa.gov/forecast).

2. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop the REAPs for all phases of construction (i.e., Grading and Land Development, Streets and Utilities, Vertical Construction, Final Landscaping and Site Stabilization).

3. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP ensure that the REAP include, at a minimum, the following site information:

    a. Site Address
    b. Calculated Risk Level (2 or 3)
    c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number
    d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
    e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number

4. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP include in the REAP, at a minimum, the following project phase information:

    a. Activities associated with each construction phase
    b. Trades active on the construction site during each construction phase
    c. Trade contractor information
    d. Suggested actions for each project phase

5. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP develop additional REAPs for project sites where construction activities are indefinitely halted or postponed (Inactive Construction). At a minimum, Inactive Construction REAPs must include:

    a. Site Address
    b. Calculated Risk Level (2 or 3)
    c. Site Storm Water Manager Information including the name, company, and 24-hour emergency telephone number

d. Erosion and Sediment Control Provider information including the name, company, and 24-hour emergency telephone number
e. Storm Water Sampling Agent information including the name, company, and 24-hour emergency telephone number
f. Trades active on site during Inactive Construction
g. Trade contractor information
h. Suggested actions for inactive construction sites

6. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP begin implementation and make the REAP available onsite no later than 24 hours prior to the likely precipitation event.

7. **Additional Risk Level 2 Requirement:** The discharger shall ensure a QSP maintain onsite a paper copy of each REAP onsite in compliance with the record retention requirements of the Special Provisions in this General Permit.

I. Risk Level 2 Monitoring and Reporting Requirements

Table 2- Summary of Monitoring Requirements

Risk Level	Visual Inspections					Sample Collection	
	Quarterly Non-storm Water Discharge	Pre-storm Event		Daily Storm BMP	Post Storm	Storm Water Discharge	Receiving Water
		Baseline	REAP				
2	**X**	**X**	**X**	**X**	**X**	**X**	

1. Construction Site Monitoring Program Requirements

   a. Pursuant to Water Code Sections 13383 and 13267, all dischargers subject to this General Permit shall develop and implement a written site-specific Construction Site Monitoring Program (CSMP) in accordance with the requirements of this Section. The CSMP shall include all monitoring procedures and instructions, location maps, forms, and checklists as required in this section. The CSMP shall be developed prior to the commencement of construction activities, and revised as necessary to reflect project revisions. The CSMP shall be a part of the Storm Water Pollution Prevention Plan (SWPPP), included as an appendix or separate SWPPP chapter.

   b. Existing dischargers registered under the State Water Board Order No. 99-08-DWQ shall make and implement necessary revisions to their Monitoring Program to reflect the changes in this General Permit in a timely manner, but no later than July 1, 2010. Existing dischargers shall continue to implement their existing Monitoring Programs in compliance with State Water Board Order No. 99-08-DWQ until the necessary revisions are completed according to the schedule above.

   c. When a change of ownership occurs for all or any portion of the construction site prior to completion or final stabilization, the new discharger shall comply with these requirements as of the date the ownership change occurs.

2. **Objectives**

   The CSMP shall be developed and implemented to address the following objectives:

   a. To demonstrate that the site is in compliance with the Discharge Prohibitions and applicable Numeric Action Levels (NALs).

b. To determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedances of water quality objectives.

c. To determine whether immediate corrective actions, additional Best Management Practice (BMP) implementation, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges.

d. To determine whether BMPs included in the SWPPP/Rain Event Action Plan (REAP) are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges.

3. **Risk Level 2 – Visual Monitoring (Inspection) Requirements for Qualifying Rain Events**

a. Risk Level 2 dischargers shall visually observe (inspect) storm water discharges at all discharge locations within two business days (48 hours) after each qualifying rain event.

b. Risk Level 2 dischargers shall visually observe (inspect) the discharge of stored or contained storm water that is derived from and discharged subsequent to a qualifying rain event producing precipitation of ½ inch or more at the time of discharge. Stored or contained storm water that will likely discharge after operating hours due to anticipated precipitation shall be observed prior to the discharge during operating hours.

c. Risk Level 2 dischargers shall conduct visual observations (inspections) during business hours only.

d. Risk Level 2 dischargers shall record the time, date and rain gauge reading of all qualifying rain events.

e. Within 2 business days (48 hours) prior to each qualifying rain event, Risk Level 2 dischargers shall visually observe (inspect):

i. all storm water drainage areas to identify any spills, leaks, or uncontrolled pollutant sources. If needed, the discharger shall implement appropriate corrective actions.

ii. all BMPs to identify whether they have been properly implemented in accordance with the SWPPP/REAP. If needed, the discharger shall implement appropriate corrective actions.

iii. any storm water storage and containment areas to detect leaks and ensure maintenance of adequate freeboard.

f. For the visual observations (inspections) described in c.i and c.iii above, Risk Level 2 dischargers shall observe the presence or absence of floating and suspended materials, a sheen on the surface, discolorations, turbidity, odors, and source(s) of any observed pollutants.

g. Within two business days (48 hours) after each qualifying rain event, Risk Level 2 dischargers shall conduct post rain event visual observations (inspections) to (1) identify whether BMPs were adequately designed, implemented, and effective, and (2) identify additional BMPs and revise the SWPPP accordingly.

h. Risk Level 2 dischargers shall maintain on-site records of all visual observations (inspections), personnel performing the observations, observation dates, weather conditions, locations observed, and corrective actions taken in response to the observations.

4. **Risk Level 2 – Water Quality Sampling and Analysis**

a. Risk Level 2 dischargers shall collect storm water grab samples from sampling locations, as defined in Section I.5. The storm water grab sample(s) obtained shall be representative of the flow and characteristics of the discharge.

b. At minimum, Risk Level 2 dischargers shall collect 3 samples per day of the qualifying event.

c. Risk Level 2 dischargers shall ensure that the grab samples collected of stored or contained storm water are from discharges subsequent to a qualifying rain event (producing precipitation of ½ inch or more at the time of discharge).

<u>Storm Water Effluent Monitoring Requirements</u>

d. Risk Level 2 dischargers shall analyze their effluent samples for:

i. pH and turbidity.

ii. Any additional parameters for which monitoring is required by the Regional Water Board.

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94103-1398

Regulatory Division FEB 23 2016

SUBJECT: File Number 2013-00030S

Mr. Len Materman
San Francisquito Creek Joint Powers Authority
615 B Menlo Avenue
Menlo Park, CA 94025

Dear Mr. Materman:

Enclosed is your signed copy of a Department of the Army permit (Enclosure 1) to construct the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, along the border between the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California.

Please complete the appropriate parts of "Project Status" form (Enclosure 2), and return it to this office as your work progresses. You are responsible for ensuring that the contractor or workers executing the activity authorized herein are knowledgeable of the terms and conditions of this authorization.

Should you have any questions regarding this matter, please call Greg Brown of our Regulatory Division at 415-503-6791. Please address all correspondence to the Regulatory Division and refer to the File Number at the head of this letter. If you would like to provide comments on our permit review process, please complete the Customer Survey Form available online at http://www.spn.usace.army.mil/Missions/Regulatory.aspx.

Sincerely,

John C. Morrow for
Lieutenant Colonel, U.S. Army
Commander and District Engineer

Enclosures

Copy Furnished (w/ encl 1 only):

US FWS, Sacramento, CA
US NMFS, Santa Rosa, CA
CA RWQCB, Oakland, CA
SF BCDC, San Francisco, CA

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94103-1398

DEPARTMENT OF THE ARMY PERMIT

PERMITTEE: Len Materman, San Francisquito Creek Joint Powers Authority

PERMIT NO.: 2013-00030S

ISSUING OFFICE: San Francisco District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate District or Division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below:

PROJECT DESCRIPTION: The project involves construction of flood control improvements along 7,450 linear feet of lower San Francisquito Creek, from Highway 101 downstream to San Francisco Bay. Work will include the following major components:

- Rebuilding levees, degrading levees, and relocating a portion of the southeast levee to widen the channel for increased channel capacity and protection from extreme tides.
- Excavating sediment deposits within the channel to maximize conveyance, and regrading a stable channel profile with marsh terraces.
- Constructing floodwalls in the upper reach to increase capacity.
- Extension of Friendship Bridge via a boardwalk across new marshland within the widened channel.

Approximately 5,650 linear feet of floodwalls will be constructed on both banks from U.S. Highway 101/East Bayshore Road downstream to approximately Daphne Way on the northwest bank (East Palo Alto side) and Geng Road on the southeast bank (Palo Alto side). Downstream of the floodwalls, approximately 2250 linear feet of the existing levee on the northwest side of the channel will be raised and strengthened to the location of the O'Connor Pump Station near Friendship Bridge. On the southeast side, approximately 2727 linear feet of new levee will be constructed inland of the existing levee on land currently occupied by the Palo Alto Golf Course, and the existing levee along this reach will be removed, except for an approximately 300-foot section around the southeastern footing of Friendship Bridge. Levee construction will permanently impact 0.70 acres of wetlands on the northwest side and 0.79 acres of wetlands on the southeast side. Portions of the channel along the toe of the floodwalls and levees will be armored with approximately 22,000 cubic yards (cy) of rock slope protection (RSP) along 4,000 linear feet (3.71 acres) of stream banks. Approximately 11,000 cy of accumulated sediment will be excavated from 4800 linear feet (2.12 acres) of the existing channel, and a new stable channel bordered by floodplain terraces will be graded within the levees. The existing Friendship Bridge will be retained and extended via a boardwalk from the retained southeastern footing across the new floodplain terrace to the relocated southeast levee. A total of 15.14 acres of native high-marsh and marsh ecotone vegetation will be planted/seeded throughout the expanded floodplain terrace. Project activities will require relocation of electrical transmission towers and poles; abandonment of existing and construction of new gas transmission lines; and realignment or relocation of sewer lines and storm drains, most of which will occur within areas to be impacted by levee construction and channel grading. Utility work will include realignment of a sewer line crossing of the creek near Friendship Bridge using open trenching, installation of a new gas line crossing under the channel using micro-tunneling upstream of Friendship Bridge, and relocation of an electrical transmission line crossing over the channel from its existing location near the north end of Jasmine Way to a new crossing location approximately 250 feet upstream. Construction of project elements will likely occur over two years, and up to 4500 linear feet of the channel will be dewatered between June 15th and October 15th each year to allow in-channel construction. Dewatering each year will be done with upstream and downstream coffer dams consisting of sheetpiles spanning the channel. Downstream of the lower cofferdam a rock energy dissipator for bypass discharge will cover approximately 7250 square feet (0.17 ac) and consist of 570 cy of temporary fill. A minimum number of gravel bags will only be used in the event of seepage past the sheet piles.

All dewatering materials will be removed from the channel immediately after each construction season and properly stored where no material can enter the channel.

In response to agency feedback and requirements, the following modifications have been incorporated into the project:

1) Faber Tract levee stability improvement: To reduce concerns regarding levee erosion and the potential for mass levee failure which would impact the Faber Tract tidal marsh, approximately 12,000 cy of clean imported fill will be added to the levee separating the creek from the Faber tract marsh downstream of Friendship Bridge. Approximately 850 linear feet of the existing levee will be strengthened by raising the levee crest elevation from a minimum elevation of 11 feet to 13 feet, and incorporating a 6H:1V levee side slope into the Faber Tract marsh, resulting in permanent impacts to 0.30 acres of existing tidal marsh. This levee side slope will help protect the levee toe from erosion due to flow overtopping as it transitions to a higher elevation closer to Friendship Bridge.
2) Bay levee degrade: Removal of approximately 600 feet of the existing levee downstream of the Faber Tract, along the Outer Faber Marsh area adjacent to San Francisco Bay. Approximately 2,820 cy of sediment/soil will be removed within approximately 0.73 acres of existing levee footprint to lower the area down to marsh plain elevation.
3) RSP reduction: Proposed RSP has been reduced by approximately 2.33 acres from the original project design, resulting in a new RSP area total of 3.71 acres. The 2.33 acres will be replaced with vegetative levee protection and turf reinforcement mat that will provide soil stabilization and habitat improvements.
4) Faber Marsh enhancement to offset impacts to Ridgway's rail and salt marsh harvest mouse: Five high tide refugia islands vegetated with native high marsh vegetation will be created in the outer Faber marsh, consisting of 100 cubic yards of fill placed across 0.03 acre of existing marsh plain. An additional 0.19 cubic yards of marsh will be temporarily impacted by work activities during island construction. Vegetation enhancement will also occur along 5120 linear feet (5.66 acre) of perimeter berm around the Faber Tract marsh.
5) Instream velocity refugia for migrating steelhead: A total of approximately 840 cubic yards of rock and woody debris will be placed in the creek channel to create up to 6 instream habitat structures, totaling 0.09 acre.

All work shall be completed in accordance with the plans and drawings titled "USACE File #2013-00030S, San Francisquito Creek, July 2015, Figure 1 to 119" (enclosure 1). High tide refugia islands shall be constructed in accordance with the plans and drawings titled "USACE File #2013-00030S, High tide refuge islands, October 2015, Figure 1 to 3" (enclosure 2). Channel dewatering and coffer dam construction shall be completed in accordance with the plans and drawings titled "USACE File #2013-00030S, Temporary water diversion plan, February 2016, Figure 1 to 9" (enclosure 3).

PROJECT LOCATION: Lower San Francisquito Creek downstream of Highway 101, on the border between the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California.

PERMIT CONDITIONS:

GENERAL CONDITIONS:

1. The time limit for completing the work authorized ends on February 28, 2021. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. For your convenience, a copy of the water quality certification or waiver is attached. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

7. You understand and agree that, if future operations by the United States require the removal, relocation or other alteration of the structure or work authorized herein, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, you will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

SPECIAL CONDITIONS:

1. To remain exempt from the prohibitions of Section 9 of the Endangered Species Act, the non-discretionary Terms and Conditions for incidental take of federally-listed Species shall be fully implemented as stipulated in the enclosed Biological Opinions from NMFS dated December 30, 2015 (NMFS # SWR-2013-9572) (enclosure 4) and USFWS dated January 15, 2016 (USFWS # 08ESMF00-2013-F-0401) (enclosure 5). Project authorization under this permit is conditional upon compliance with the mandatory terms and conditions associated with incidental take. Failure to comply with the terms and conditions for incidental take, where a take of a federally-listed species occurs, would constitute an unauthorized take and non-compliance with the authorization for your project. The USFWS and NMFS are, however, the authoritative federal agencies for determining compliance with the incidental take statements and for initiating appropriate enforcement actions or penalties under the Endangered Species Act.

2. The JPA shall provide compensatory mitigation for impacts to waters of the U.S. by fully implementing the *San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project: Mitigation and Monitoring Plan*, dated December 2015. Restoration performance standards shall be adhered to, and an annual monitoring report shall be submitted to USACE by December 31 for five years following the completion of construction. This report shall include dated photographs that cover the entire project reach, including the creek and both banks. If performance standards are not being met, a brief explanation of the difficulties and potential remedial actions shall be provided.

3. Your responsibility to complete the required compensatory mitigation as set forth in Special Condition 2 will not be considered fulfilled until you have demonstrated mitigation success and have received written verification from the U.S. Army Corps of Engineers.

4. The JPA shall submit 60 percent and 90 percent design plans for steelhead habitat features (*i.e.,* debris jams and rock weir) to NMFS and USACE for review and approval at least 90 days prior to the initiation of construction activities.

5. In addition to General Condition 3, you shall comply with the following:
   a. If cultural resources are encountered during project implementation, the JPA shall immediately cease all work activities in the area (within approximately 100-feet) of the discovery. Prehistoric archaeological materials might include obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or toolmaking debris; culturally darkened soil ("midden") containing heat-affected rocks, artifacts, or shellfish remains; and stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered

stone tools, such as hammerstones and pitted stones. Historic-period materials might include stone, concrete, or adobe footings and walls; filled wells or privies; and deposits of metal, glass, and/or ceramic refuse. USACE shall be notified of the discovery and a professional archaeologist shall be retained by the JPA to evaluate the find and recommend appropriate mitigation measures. Proposed mitigation measures shall be submitted for USACE approval, and project related activities shall not resume within 100 feet of the find until USACE provides written authorization.

b. If human remains are encountered unexpectedly during construction excavation and grading activities, no further disturbance shall occur within 100 feet of the find until the County Coroner has made the necessary findings as to origin and disposition pursuant to PRC Section 5097.98. If the remains are determined to be of Native American descent, the coroner has 24 hours to notify the Native American Heritage Commission (NAHC). The NAHC will then identify the person(s) thought to be the Most Likely Descendent of the deceased Native American, who may make recommendations regarding the appropriate treatment of the remains. Project-related activities in the vicinity of the find shall not resume until USACE provides written authorization.

FURTHER INFORMATION:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

   (x) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. Section 403).
   (x) Section 404 of the Clean Water Act (33 U.S.C. Section 1344).
   ( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. Section 1413).

2. Limits of this authorization:

   a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.

   b. This permit does not grant any property rights or exclusive privileges.

   c. This permit does not authorize any injury to the property or rights of others.

   d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability: In issuing this permit, the Federal Government does not assume any liability for the following:

   a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

   b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

   c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

   d. Design or construction deficiencies associated with the permitted work.

   e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision: This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

   a. You fail to comply with the terms and conditions of this permit.

   b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate. (See Item 4 above.)

   c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

   Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 C.F.R. § 325.7 or enforcement procedures such as those contained in 33 C.F.R. §§ 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 C.F.R. § 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions: General Condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

(PERMITTEE) (DATE) February 23, 2016

Len Materman
San Francisquito Creek Joint Powers Authority

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

for
John C. Morrow
Lieutenant Colonel, U.S. Army
District Commander

(DATE) 23 Feb 2016

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE) (DATE)

PROJECT STATUS

Please use the forms below to report the dates when you start and finish the work authorized by the enclosed permit. Also if you suspend work for an extended period of time, use the forms below to report the dates you suspended and resumed work. The second copy is provided for your records. If you find that you cannot complete the work within the time granted by the permit, please apply for a time extension at least one month before your permit expires. If you materially change the plan or scope of the work, it will be necessary for you to submit new drawings and a request for a modification of your permit.

(cut as needed) ---

Date:______________

NOTICE OF COMPLETION OF WORK under Department of the Army Permit No. 2013-00030S
TO: District Engineer, US Army Corps of Engineers, Regulatory Division, 1455 Market Street, 16th Floor, San Francisco, CA 94103-1398

In compliance with the conditions of Permit No. 2013-00030S, this is to notify you that work was completed on ______________________.

Permittee: Len Materman, San Francisquito Creek Joint Powers Authority
Address: 615 B Menlo Avenue, Menlo Park, CA 94025

(cut as needed) ---

Date:_______________

NOTICE OF RESUMPTION OF WORK under Department of the Army Permit No. 2013-00030S
TO: District Engineer, US Army Corps of Engineers, Regulatory Division, 1455 Market Street, 16th Floor, San Francisco, CA 94103-1398

In compliance with the conditions of Permit No. 2013-00030S, this is to notify you that work was resumed on ______________________.

Permittee: Len Materman, San Francisquito Creek Joint Powers Authority
Address: 615 B Menlo Avenue, Menlo Park, CA 94025

(cut as needed) ---

Date:________________

NOTICE OF SUSPENSION OF WORK under Department of the Army Permit No. 2013-00030S
TO: District Engineer, US Army Corps of Engineers, Regulatory Division, 1455 Market Street, 16th Floor, San Francisco, CA 94103-1398

In compliance with the conditions of Permit No. 2013-00030S, this is to notify you that work was suspended on ______________________.

Permittee: Len Materman, San Francisquito Creek Joint Powers Authority
Address: 615 B Menlo Avenue, Menlo Park, CA 94025

(cut as needed) ---

Date:________________

NOTICE OF COMMENCEMENT OF WORK under Department of the Army Permit No. 2013-00030S
TO: District Engineer, US Army Corps of Engineers, Regulatory Division, 1455 Market Street, 16th Floor, San Francisco, CA 94103-1398

In compliance with the conditions of Permit No. 2013-00030S, this is to notify you that work was commenced on ________________________.

Permittee: Len Materman, San Francisquito Creek Joint Powers Authority
Address: 615 B Menlo Avenue, Menlo Park, CA 94025

PRELIMINARY JURISDICTIONAL DETERMINATION FORM
San Francisco District

This Preliminary Jurisdictional Determination finds that there *"may be"* waters of the United States in the subject review area and identifies all such aquatic features, based on the following information:

Regulatory Division: South Branch **File Number:** 2013-00030-S **PJD Completion Date:** 02-18-2016

Review Area Location
City/County: Palo Alto, Santa Clara Cnty. State: California
Nearest Named Waterbody: San Francisquito Creek
Approximate Center Coordinates of Review Area
Latitude (degree decimal format): 37.46055°N
Longitude (degree decimal format): -122.12123°W
Approximate Total Acreage of Review Area: 263.5 acres

File Name: San Francisquito Creek Flood Protection

Applicant or Requestor Information
Name: Kevin Murray
Company Name: San Francisquito Creek JPA
Street/P.O. Box: 615 B Menlo Avenue
City/State/Zip Code: Menlo Park, CA 94025

Estimated Total Amount of Waters in Review Area

Non-Wetland Waters: lineal feet feet wide and/or 23.88 acre(s) Flow Regime: Perennial

Wetlands: lineal feet feet wide and/or 116.93 acre(s) Cowardin Class: Multiple Classes

Name of Section 10 Waters Occurring in Review Area
Tidal: San Francisquito Creek
Non-Tidal:

☐ Office (Desk) Determination
☒ Field Determination:
Date(s) of Site Visit(s): 02-06-2013

SUPPORTING DATA: Data reviewed for Preliminary JD (check all that apply – checked items should be included in case file and, where checked and requested, appropriately reference sources below)

☒ Maps. Plans, plots or plat submitted by or on behalf of applicant/requestor (specify): PRELIMINARY DELINEATION: SAN FRANCISQUITO CREEK FLOOD PROTECTION PROJECT, EAST BAYSHORE ROAD TO SAN FRANCISCO BAY, dated June 2012

☒ Data sheets submitted by or on behalf of applicant/requestor (specify): included with above

- ☒ Corps concurs with data sheets/delineation report.
- ☐ Corps does not concur with data sheets/delineation report.

☐ Data sheets prepared by the Corps.
☐ Corps navigable waters' study (specify):
☒ U.S. Geological Survey Hydrologic Atlas:
- ☒ USGS NHD data.
- ☒ USGS HUC maps.

☒ U.S. Geological Survey map(s) (cite quad name/scale): Palo Alto, CA 1:24000
☐ USDA Natural Resources Conservation Service Soil Survey.
☒ National wetlands inventory map(s) (specify): web data
☐ State/Local wetland inventory map(s) (specify):
☐ FEMA/FIRM maps.
☐ 100-year Floodplain Elevation (specify, if known):
☐ Photographs: ☐ Aerial (specify name and date):
☐ Other (specify name and date):
☐ Previous JD determination(s) (specify File No. and date of response letter):
☐ Other information (specify):

IMPORTANT NOTE: If the information recorded on this form has not been verified by the Corps, the form should not be relied upon for later jurisdictional determinations.

Gregory M. 2-18-16
Signature and Date of Regulatory Project Manager
(REQUIRED)

Kevin Murray February 18, 2016
Signature and Date of Person Requesting Preliminary JD
(REQUIRED, unless obtaining the signature is impracticable)

EXPLANATION OF PRELIMINARY AND APPROVED JURISDICTIONAL DETERMINATIONS:

1. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

2. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "preconstruction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable.

Aquatic Resource I.D.	Latitude (degree decimal format)	Longitude (degree decimal format)	Cowardin Class and Flow Regime	Estimated Area or Lineal Feet of Aquatic Resource	Type of Aquatic Resource
dm	37.45958°N	-122.12256°W	Palustrine-emergent Flow: Perennial	lineal ft ft wide 4.34 acre(s)	Brackish Marsh
fm	37.45343°N	-122.12008°W	Palustrine-emergent Flow: Perennial	lineal ft ft wide 0.33 acre(s)	Pond or Lake w/ Emergent Vegetation
tsm	37.46216°N	-122.12398°W	Estuarine Flow: Perennial	lineal ft ft wide 112.26 acre(s)	Salt Marsh
fp	37.45340°N	-122.12009°W	Lacustrine Flow: Perennial	lineal ft ft wide 1.13 acre(s)	Pond or Lake
tc	37.46052°N	-122.12379°W	Estuarine Flow: Perennial	lineal ft ft wide 22.38 acre(s)	Estuary
tp	37.46300°N	-122.12375°W	Estuarine Flow: Perennial	lineal ft ft wide 0.37 acre(s)	Estuary
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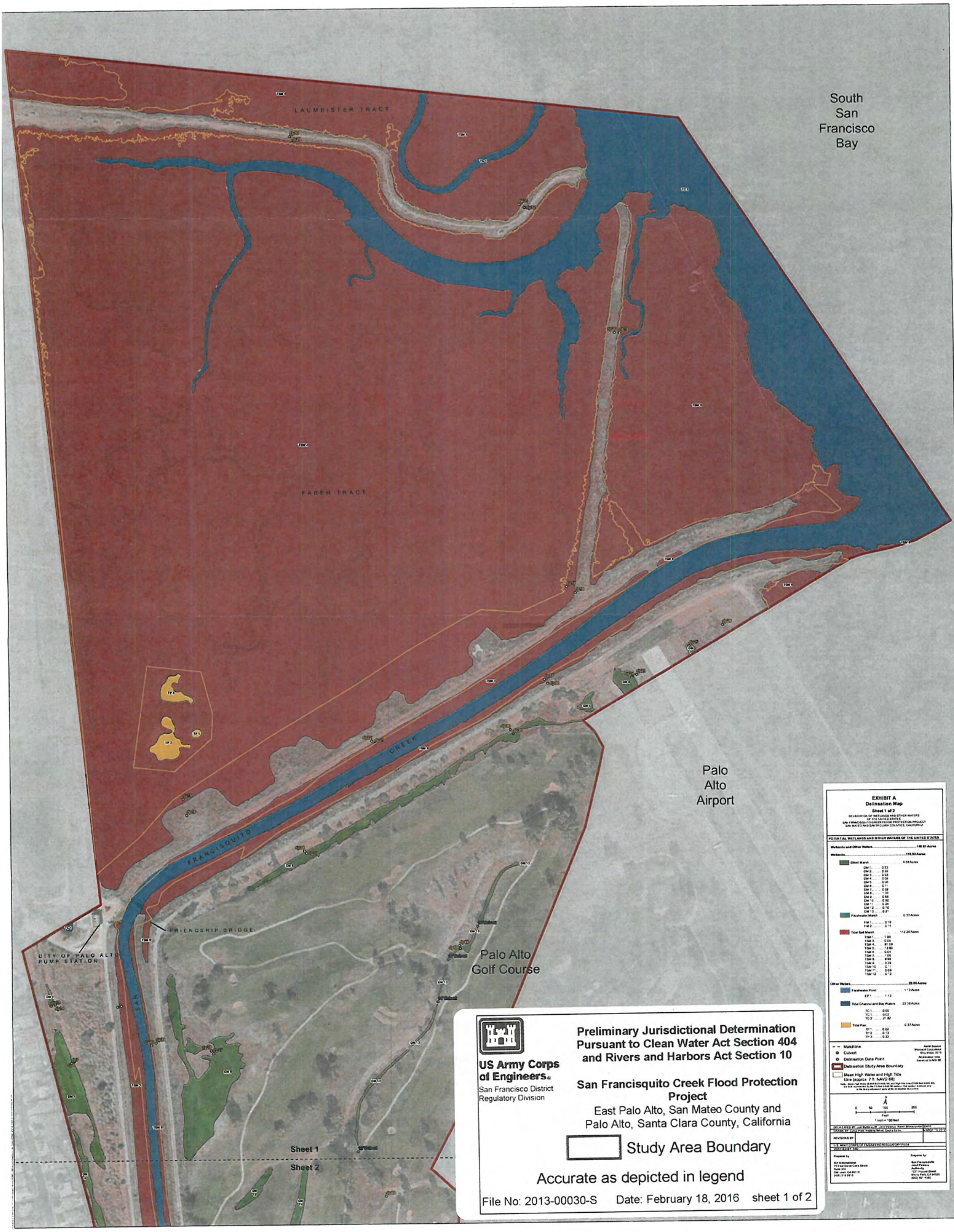
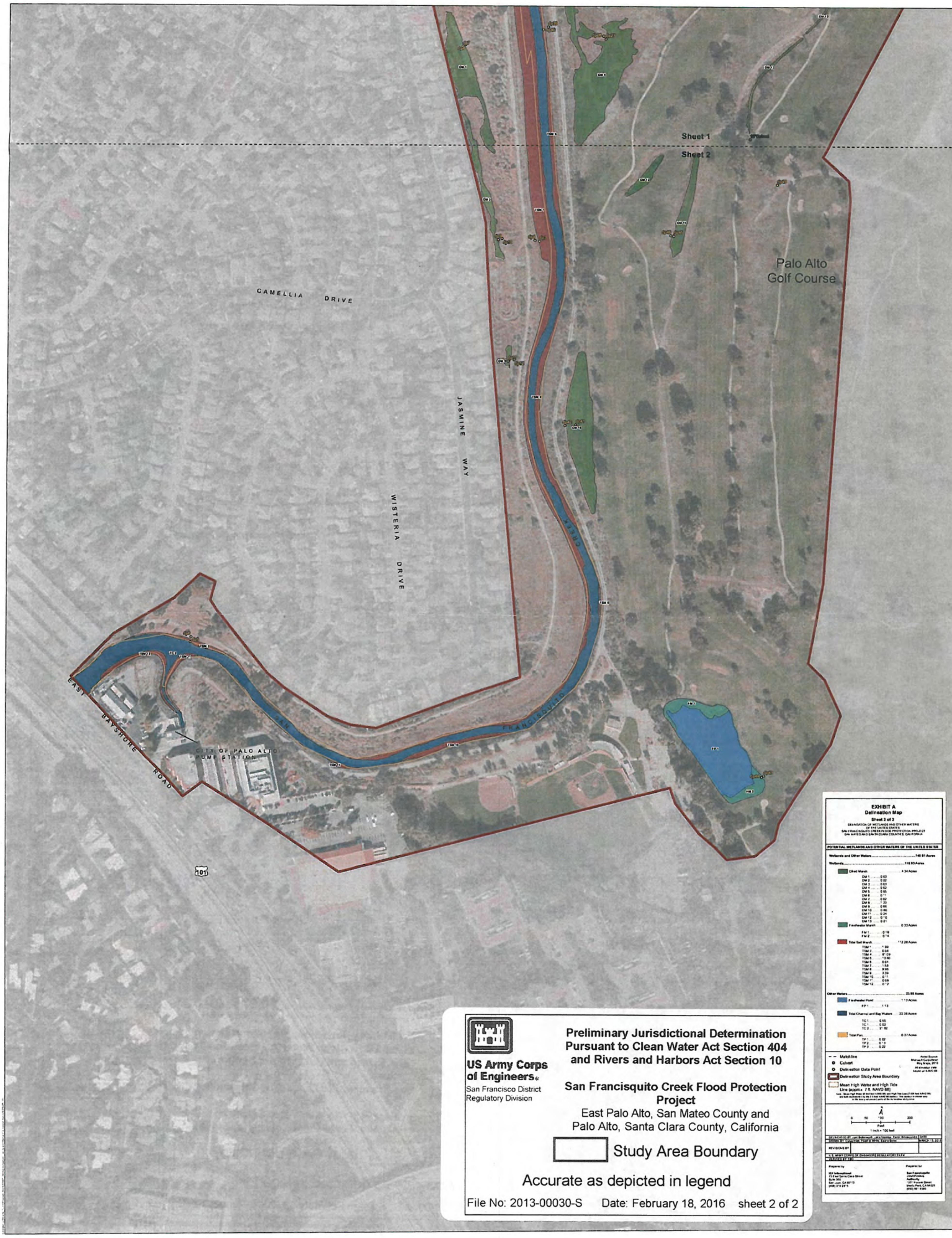


South San Francisco Bay
LAUMEISTER TRACT
FABER TRACT
FRANCISQUITO CREEK
SAN
FRIENDSHIP BRIDGE
CITY OF PALO ALTO PUMP STATION
Palo Alto Airport
Palo Alto Golf Course
Sheet 1
Sheet 2
EXHIBIT A
Delineation Map
Sheet 1 of 2
US Army Corps of Engineers
San Francisco District
Regulatory Division
Preliminary Jurisdictional Determination Pursuant to Clean Water Act Section 404 and Rivers and Harbors Act Section 10
San Francisquito Creek Flood Protection Project
East Palo Alto, San Mateo County and Palo Alto, Santa Clara County, California
Study Area Boundary
Accurate as depicted in legend
File No: 2013-00030-S
Date: February 18, 2016
sheet 1 of 2



US Army Corps of Engineers®
San Francisco District
Regulatory Division

Preliminary Jurisdictional Determination Pursuant to Clean Water Act Section 404 and Rivers and Harbors Act Section 10

San Francisquito Creek Flood Protection Project

East Palo Alto, San Mateo County and Palo Alto, Santa Clara County, California

Study Area Boundary

Accurate as depicted in legend

File No: 2013-00030-S Date: February 18, 2016 sheet 2 of 2

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94103-1398

Regulatory Division

FEB 23 2016

SUBJECT: File Number 2013-00030S

Mr. Len Materman
San Francisquito Creek Joint Powers Authority
615 B Menlo Avenue
Menlo Park, CA 94025

Dear Mr. Materman:

Enclosed are two copies of a Department of the Army (DA) permit to construct the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, along the border between the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California.

You are advised that the Corps has established an Administrative Appeal Process, as described in our regulations at 33 C.F.R. Part 331 (65 Fed. Reg. 16486; March 28, 2000) and outlined in the enclosed flowchart and Notification of Administrative Appeal Options, Process, and Request for Appeal (NAO-RFA) form. The following two options are available to you in your evaluation of the enclosed permit:

1) You may sign and date both copies of the permit on the line designated for "Permittee". Your signature on the permit indicates that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions. Both copies of the permit must be returned to this office for final authorization. We will then forward one copy of the fully executed permit for your records, at which time you will be authorized to commence work.

2) You may decline to sign the permit because you object to certain terms and conditions, and you may request that the permit be modified. If you decline the permit, you must return the permit to the District Engineer and may not proceed with your project until notified by the District Engineer. You must outline your objections to the terms and conditions of the permit by completing Section II of the NAO-RFA form. Your objections must be received by the District Engineer within 60 days of the date of this letter, or you will forfeit your right to request changes to the terms and conditions of the permit.

Upon receipt of the completed NAO-RFA form, the District Engineer will evaluate your objections, and may: (a) modify the permit to address all of your objections, (b) modify the permit to address some of your objections, or (c) not modify the permit, having determined that the permit should be issued as previously written. In any of these three cases, the District Engineer will send you a final permit for your reconsideration, as well as a second NAO-RFA form. Should you decline the final proffered permit, you can appeal the declined permit by submitting the completed NAO-RFA form to the Division Engineer. The NAO-RFA form must be received by the Division Engineer within 60 days of the date of the second transmittal letter, or you will forfeit your right to pursue an appeal.

If you fail to sign and return both copies of this permit or fail to request a modification of the permit within 60 days from the date of this letter, your permit application may be withdrawn pursuant to our regulations at 33 C.F.R. Section 325.2(d)(5).

Should you have any questions regarding this matter, please call Greg Brown of our Regulatory Division at 415-503-6791. Please address all correspondence to the Regulatory Division and refer to the File Number at the head of this letter.

Sincerely,

John C. Morrow for
Lieutenant Colonel, U.S. Army
Commander and District Engineer

Enclosures

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Len Materman, San Francisquito Creek Joint Powers Authority		File No. 2013-00030S	Date: 02/23/2016
Attached is:			See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
✓	PROFFERED PERMIT (Standard Permit or Letter of permission)		B
	PERMIT DENIAL		C
	APPROVED JURISDICTIONAL DETERMINATION		D
	PRELIMINARY JURISDICTIONAL DETERMINATION		E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the DISTRICT ENGINEER for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this Notice and return the Notice to the DISTRICT ENGINEER. Your objections must be received by the DISTRICT ENGINEER within 60 days of the date of this Notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your NOTICE, the DISTRICT ENGINEER will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the DISTRICT ENGINEER will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the DISTRICT ENGINEER for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this NOTICE and sending the NOTICE to the DIVISION ENGINEER. This Notice must be received by the DIVISION ENGINEER within 60 days of the date of this Notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this Notice sending the Notice to the DIVISION ENGINEER. This Notice must be received by the DVISION ENGINEER within 60 days of the date of this Notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this Notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this Notice and sending the Notice to the DIVISION ENGINEER. This Notice must be received by the DIVISION ENGINEER within 60 days of the date of this Notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

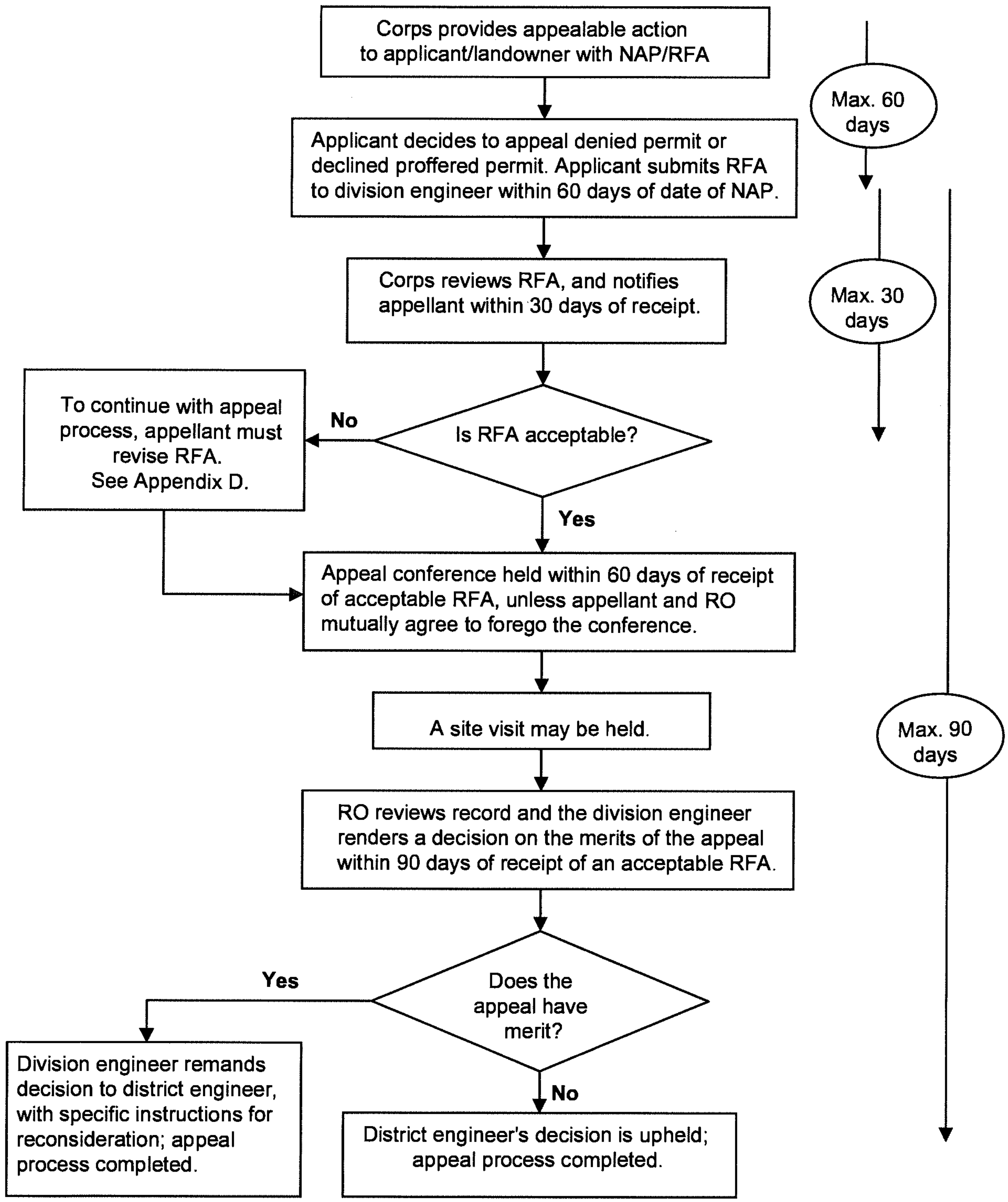
POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: Katerina Galacatos, Chief, South Branch, Regulatory Division U.S. Army Corps of Engineers, San Francisco District 1455 Market Street, 16th Floor, Attn: CESPN-R-S San Francisco, CA 94103-1398 Tel. (415) 503-6778 FAX (415) 503-6690	If you only have questions regarding the appeal process you may also contact: Thomas J. Cavanaugh, Appeal Review Officer U.S. Army Corps of Engineers, South Pacific Division 1455 Market Street, 20th Floor, Attn: CESPD-PDS-O San Francisco, CA 94103-1399 Tel. (415) 503-6574 FAX (415) 503-6646

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

______________________________ Signature of appellant or agent.	Date:	Telephone number:

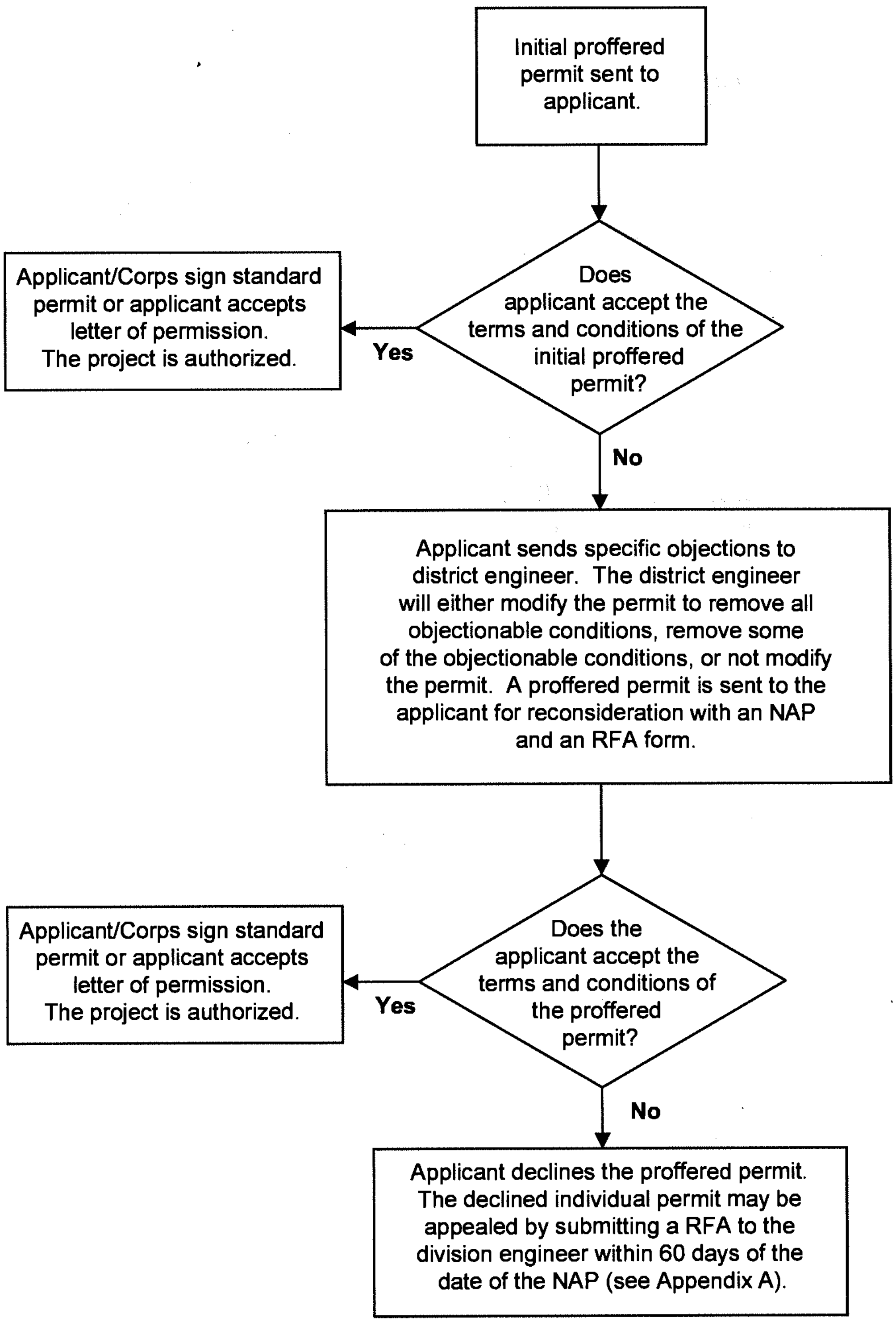
Administrative Appeal Process for Permit Denials and Proffered Permits



NOTE: If new information is provided to the Corps, the applicant will be asked if the applicant wishes to revise the project or record. If so, the appeal will be withdrawn and the case returned to the District for appropriate action. If not, then the Division Engineer will rule on the merits of the appeal based on the administrative record without consideration of the new information. However, the new information may cause the District Engineer to take action under 33 CFR 325.7, independent of the appeal process.

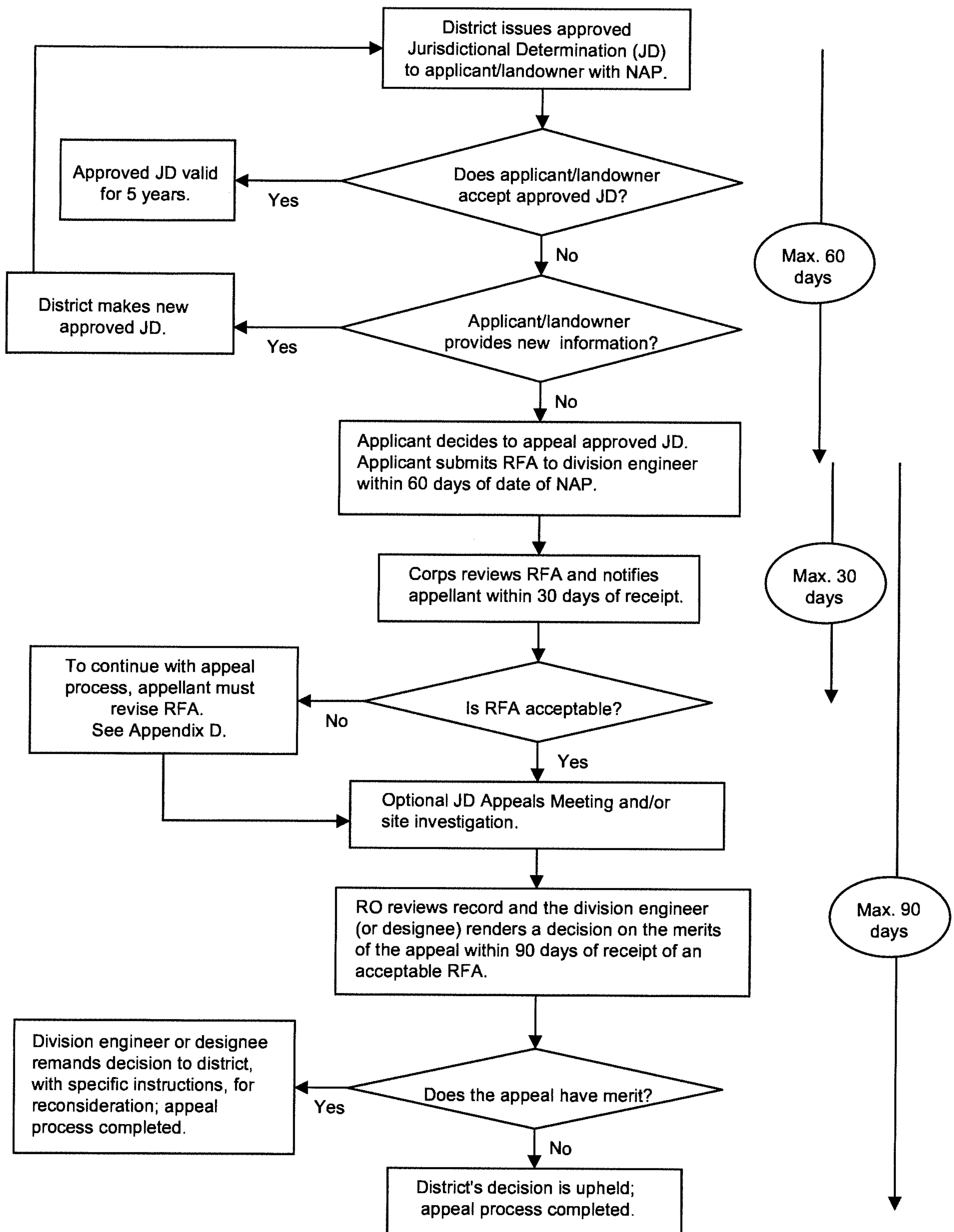
Appendix A

Applicant Options with Initial Proffered Permit



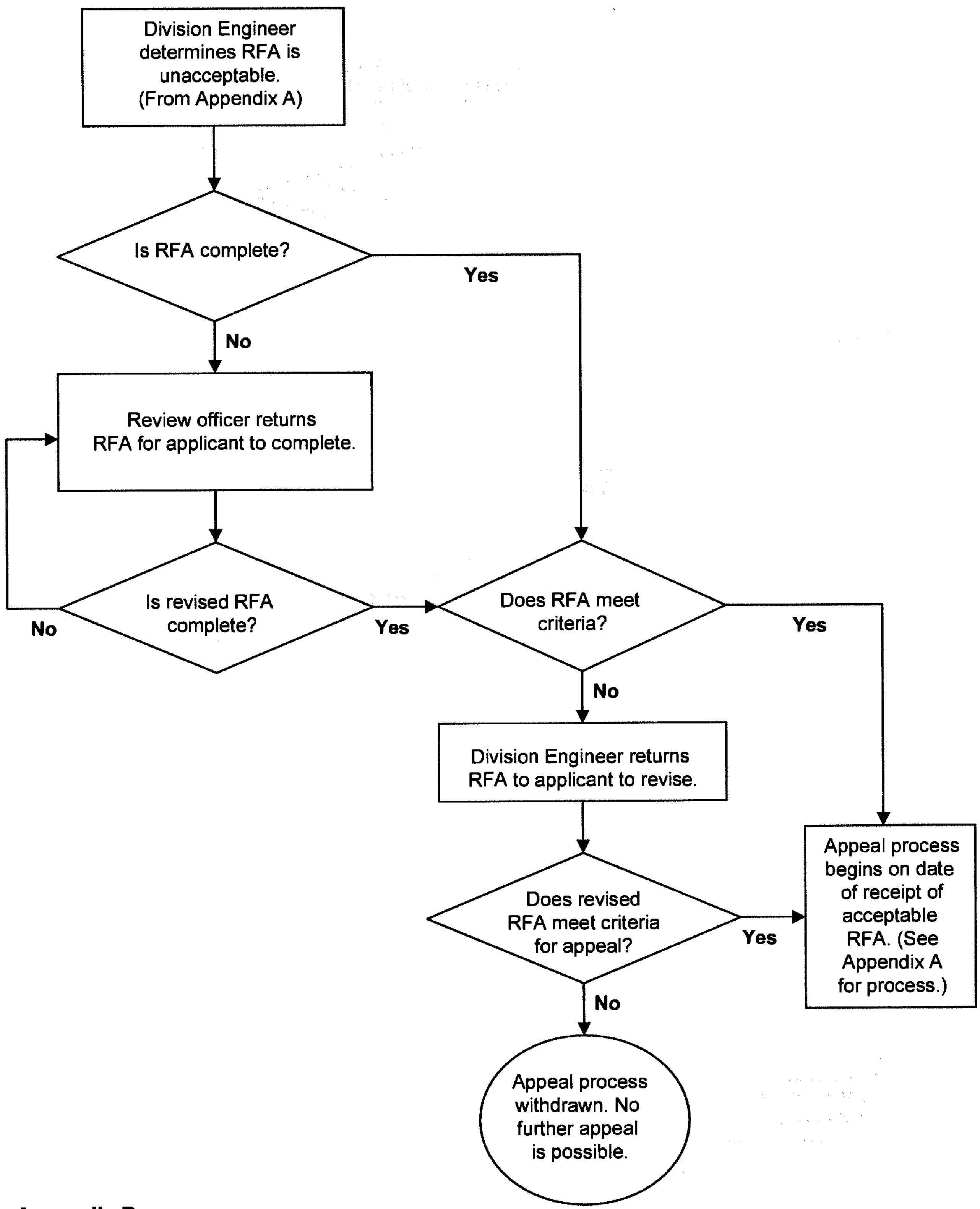
Appendix B

Administrative Appeal Process for Approved Jurisdictional Determinations



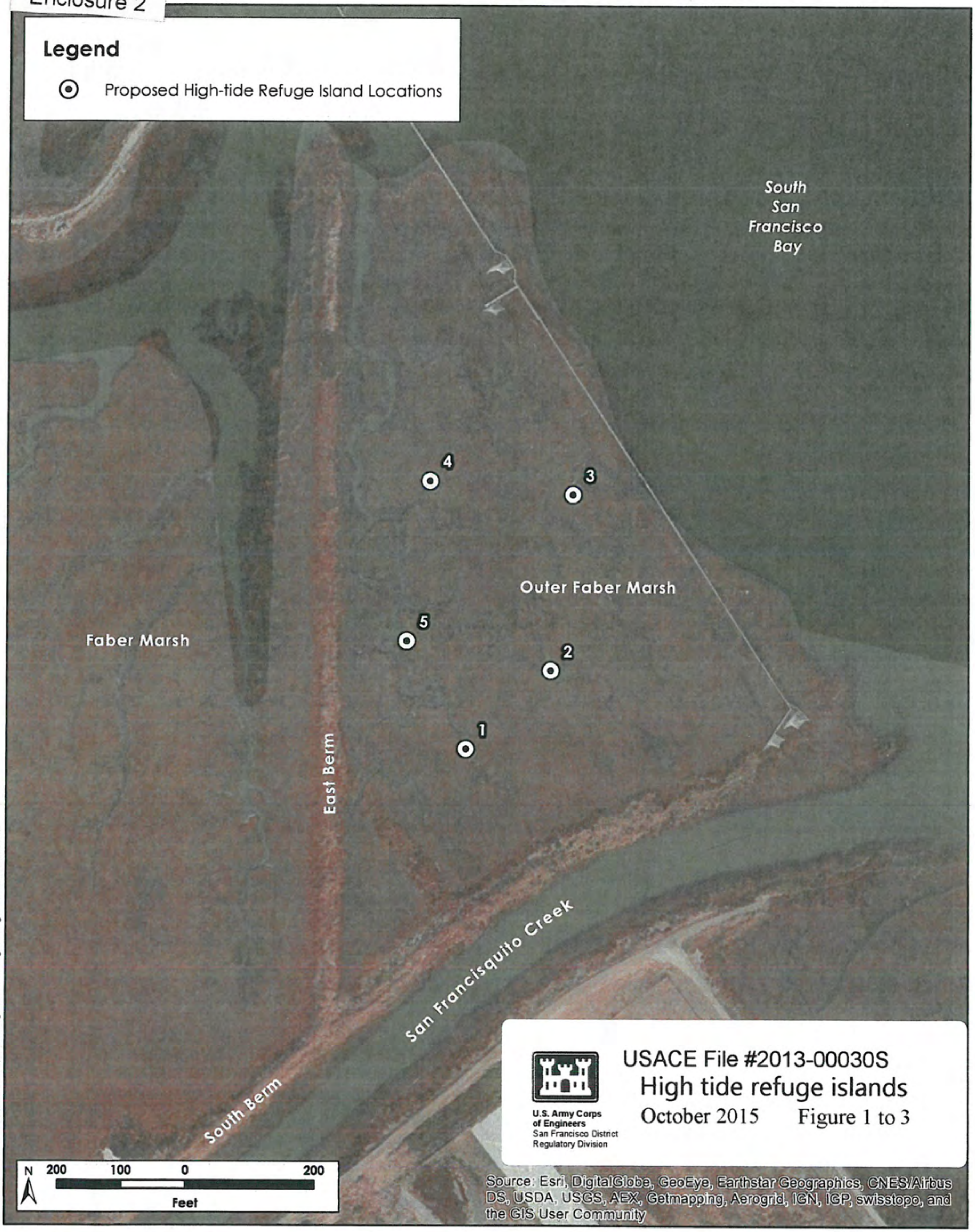
Appendix C

Process for Unacceptable Request for Appeal



Appendix D

Enclosure 2



N:\Projects3700\3700-01\Reports\Conceptual Revegetation Plan\Fig 6 Refuge Island Locations.mxd

H. T. HARVEY & ASSOCIATES

Ecological Consultants

Figure 6. Refuge Island Locations

San Francisquito Creek Flood Protection Project

Conceptual High Tide Refuge Habitat Enhancement Plan (3700-01)

October 2015

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94103-1398

MAY 25 2016

Regulatory Division

SUBJECT: Permit No. 2013-00030S

LETTER OF MODIFICATION

Mr. Len Materman
San Francisquito Creek Joint Powers Authority
615 B Menlo Avenue
Menlo Park, California 94025

Dear Mr. Materman:

This letter is in regards to modification of permit No. 2013-00030S for the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project. Your project was authorized under Individual Permit 2013-00030S pursuant to Section 404 of the Clean Water Act of 1972, as amended (33 U.S.C. § 1344 *et seq.*), and Section 10 of the Rivers and Harbors Act of 1899, as amended (33 U.S.C. § 403 *et seq.*), to improve the channel and levees of lower San Francisquito Creek, along the border between the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California.

The modification is necessary to implement changes in scheduling and additional work restrictions as a result of new information on the occurrence of Ridgway's rails (*Rallus obsoletus obsoletus*) within the project area. Work shall otherwise be performed as described in the Individual Permit issued February 23, 2016.

Permit No. 2013-00030S is hereby modified under the provisions of 33 CFR § 325.7(b) to include the following special condition:

1a. To maintain compliance with Special Condition 1, you must comply with all revised construction schedules, conservation measures, and incidental take limits in the enclosed Biological Opinion (BO) amendment (08ESMF00-2013-F-0401-R001) titled "Reinitiation of Formal Consultation on the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, from San Francisco Bay to Highway 101, in the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California (U.S. Army Corps of Engineers file number 2013-00030)" issued by the U.S. Fish and Wildlife Service on April 29, 2016 (enclosure 1), in additional to the terms and conditions of the original BO (08ESMF00-2013-F-0401) issued January 15, 2016 (enclosure 2).

Except for the above modification, all terms and conditions of the original permit authorization remain in effect.

Any questions regarding this matter can be directed to Greg Brown of our Regulatory Division at 415-503-6791 or gregory.g.brown@ usace.army.mil. Please address all correspondence to the Regulatory Division and refer to the File Number at the head of this letter.

The San Francisco District is committed to improving service to our customers. My Regulatory staff seeks to achieve the goals of the Regulatory Program in an efficient and cooperative manner, while preserving and protecting our nation's aquatic resources. If you would like to provide comments on our Regulatory Program, please complete the Customer Service Survey Form available on our website: http://www.spn.usace.army.mil/Missions/ Regulatory.aspx

Sincerely,

Gregory D Brown

Gregory Brown
Senior Project Manager
Regulatory Division, San Francisco District

Enclosure

Copies Furnished (w/o encl):

CA RWQCB, Oakland, CA (attn: Susan Glendening)
US FWS, Sacramento, CA (attn: Joseph Terry)
US NMFS, Santa Rosa, CA (attn: Amanda Morrison)

Sent via electronic mail: No hard copy to follow

April 7, 2015
CIWQS Place No. 757384 (SG)

San Francisco Creek Joint Powers Authority
615 B Menlo Avenue
Menlo Park, CA 94025

Attention: Len Materman
Email: Len@sfcjpa.org

Subject: Conditional Water Quality Certification for the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, Cities of Palo Alto and East Palo Alto, Santa Clara and San Mateo Counties

Dear Mr. Materman:

Regional Water Board staff has reviewed the application materials submitted by the San Francisquito Creek Joint Powers Authority (JPA) for the proposed San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project (Project) located in Santa Clara and San Mateo counties. The Santa Clara Valley Water District (District) is the Project's local sponsor. The JPA has applied to the U.S. Army Corps of Engineers (Corps) Regulatory Branch for an Individual Permit to: (1) discharge dredge and fill materials to waters of the United States pursuant to section 404 of the Clean Water Act (CWA) (33 U.S.C. 1344); and (2) place structures and work in navigable waters pursuant to section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 320.2). We have determined that the Project, as proposed, will not violate State water quality standards and accordingly issue a conditional CWA section 401 water quality certification (Certification) for the Project.

The JPA submitted a certification application for the Project dated March 12, 2013. On February 27, 2014, the Regional Water Board denied the application without prejudice based on insufficient information on which to issue certification. The JPA resubmitted the application on July 31, 2014. The Regional Water Board issued a second incomplete application letter requesting additional information on August 29, 2014. The JPA provided supplemental information, which was received October 10 and October 17, 2014, upon which the Regional Water Board determined the application to be complete. All referenced materials submitted by the JPA are collectively referred to as the Application.

As of the date of this Certification, aspects of the Project remain under discussion with other government agencies, and, as such, the Project design may be subject to change. Also as a result, the JPA has in some cases submitted application information that is not final or has not yet submitted information necessary for the Regional Water Board to accept final plans (e.g., for mitigation for impacts to creeks and wetlands, coffer dam construction and removal, creek dewatering, groundwater management, utility line construction and abandonment, placement and stabilization of fill in levees and on wetlands, beneficial reuse of excavated sediment, and disposal of excess sediment/cut). Where that is the case, this Certification requires submittal of final plans, acceptable to the Regional Water Board Executive Officer (Executive Officer), prior to commencement of Project construction or commencement of construction for the relevant Project component.

A. Project Location and Site Description

The Project is located on San Francisquito Creek (Creek) along a 1.5-mile stretch of the Creek from San Francisco Bay to East Bayshore Road, a frontage road to U.S. Highway 101. This stretch of the Creek is a managed earthen flood control channel. The Project is designed to increase the flow conveyance capacity of the creek channel for a combination of the 100-year flow event, the 100-year high tide event, and 26 inches of sea level rise.

This stretch of the Creek is on the boundary between Santa Clara and San Mateo counties. The Project area is divided into three reaches. A reach is a continuous part of the Creek between two specified points. The lower reach is from San Francisco Bay to Friendship Bridge, the middle reach from Friendship Bridge to Daphne Way, and the upper reach from Daphne Way to East Bayshore Road. This Certification refers to the Project area south of the creek channel centerline as the “south bank” and the area north of the creek channel centerline as the “north bank.” The JPA refers to these areas as left and right banks, respectively, in its design plans and other documents. From the JPA naming scheme, the station numbers along the Creek and levees are labeled “L-line” for station locations south of the creek channel, “R-line” for station locations north of the creek channel, and “C-line” for the creek channel centerline stations.

The City of Palo Alto, within Santa Clara County, borders the south bank in all three reaches. The Palo Alto Municipal Golf Course borders the majority of the south bank, with the Palo Alto airport bordering a 600-foot stretch of the eastern-most section of the south bank. The north bank of the Project area is bordered by San Mateo County, with the Faber Tract Marsh in the lower reach and the City of East Palo Alto in the middle and upper reach borders.

The Creek provides important migration, spawning, and juvenile rearing habitat for winter-run steelhead. In addition, green sturgeon and longfin smelt are known to inhabit the South Bay and its tidally-influenced tributaries. The Faber Tract and the Laumeister Tract (north of the Faber Tract) provide ideal habitat for special status species including Ridgway’s (formerly California clapper) rail, black rail, salt marsh harvest mouse, and salt marsh wandering shrew. Additionally, suitable habitat occurs along the creek channel, and these species have the potential to occur in the Project area.

B. Project Purpose

The purpose of the Project is to improve the Creek’s channel capacity to accommodate the 100-year flood flow event for Creek flows coupled with the influence of San Francisco Bay tides, including projected sea level rise, from the downstream face of East Bayshore Road down to the Bay. It would reduce local fluvial flood risks in the Project area during storm events, provide the capacity needed for future upstream improvements, and increase and improve ecological habitat and recreational opportunities.

C. Project Description

The JPA proposes to increase the Creek’s flood flow capacity to contain the one percent flood flow event through the following activities:

1. **Excavate in-channel sediments:** About 175,890 cubic yards of sediment will be removed from along 5,775 linear feet of the creek channel and associated channel expansion area to increase creek capacity and to maximize conveyance. In-channel sediment will not be reused because it is unlikely to provide suitable material for levee embankment use.

2. **Rebuild and relocate levees:** The JPA will widen the creek channel by rebuilding the East Palo Alto Levee (Northern Levee) and relocating the Palo Alto Levee/Palo Alto Municipal Golf Course Levee (Southern Levee), which will reduce tidal influences in the Creek and increase channel capacity.

   a. *Northern Levee:* About 3,296 linear feet (station (STA) 30+00 to STA 55+00) of the levee will be raised to increase channel capacity. As shown in the draft 100 percent design plans, sheets X-7 through X-14, the elevation increase varies by up to 4 feet based on existing conditions and the necessary modifications along the levee. Approximately 55,000 cubic yards of fill will be used to increase the height of the levee.

   b. *Southern Levee:* About 2,728 linear feet (STA 23+00 to STA 54+00) will be relocated up to approximately 200 feet into the Palo Alto Municipal Golf Course and raised to increase channel capacity. The elevation increase varies by up to 4 feet based on existing conditions and the necessary modifications at each station as shown in sheets X-6 through X-14 in the draft 100 percent design plans. Approximately 84,700 cubic yards of fill will be used for the levee relocation.

3. **Construct levee maintenance roads:** The JPA will build about 10,176 linear feet of maintenance roads on the newly raised and relocated levees. The maintenance roads will also serve as pedestrian/bicycle trails. The roads will be up to 16 feet wide and paved with crushed granite, except for a section on the south bank from stations L-line 28+00 through 54+00 that will be paved with asphalt as part of the Bay Trail. The Bay Trail section will have up to 41,600 square feet of asphalt (2,600 linear feet, up to 16 feet wide), as shown in sheet G-3 in the Application's supplemental figures. This Certification requires the JPA to submit a Post-Construction Stormwater Management Plan to describe how stormwater runoff from the paved Bay Trail surface will be diverted away from the Creek and other waters of the State, consistent with the Regional Water Board's Municipal Regional Stormwater Permit (NPDES Permit No. CAS612008; Order No. R2-2009-0074, as amended by Order No. R2-2011-0083, and as may be subsequently amended or reissued) requirements for post-construction stormwater management for new or replacement impervious surfaces.

4. **Raise and grade the Faber Tract Levee:** The JPA will raise and grade a portion of the currently unmaintained levee between the Creek and the Faber Tract (Faber Tract Levee) closer to its original design elevation to stabilize the levee. The new levee design will allow the Creek to periodically flood the marsh to mimic the current discharge pattern.

   Fill will be added to the Faber Tract Levee along 350 linear feet (0.77 acres) (STA 21+00 to STA 24+00) to reduce concerns regarding levee erosion and the potential for mass wasting leading to levee failure. In addition, the JPA will raise the lowest levee crest elevation downstream of the Friendship Bridge from a minimum elevation of 11 feet to 13 feet and incorporate a 6H:1V levee side slope on the side sloping into the Faber Tract. The 6H:1V levee side slope will help protect the levee toe from potential erosion due to flow overtopping along a 400 foot distance as the levee transitions upstream to a higher elevation closer to the Friendship Bridge. The new area of impact from the existing levee toe to the proposed levee toe is approximately 0.42 acres (18,383 square feet). Approximately 12,000 cubic yards of clean imported fill will be used to increase the height of the levee.

5. **Degrade Bay Levee:** The JPA will degrade a section of the levee north of the Creek and east of the Faber Tract (Bay Levee) to restore the Creek-Bay interface in the marsh area east of the Faber Tract and to reduce water surface elevations in the Creek between Friendship Bridge and the Bay. About 2,820 cubic yards of sediment/soil will be removed along 600 linear feet (0.73 acres) of the Bay Levee (STA 3+50 to 9+50) downstream of the Faber Tract in a marsh area that is already subject to daily tides from the Bay. This will further connect the marsh to the Creek, allow the channel to expand out over the marsh area at a point further upstream than under existing conditions, and decrease the water surface elevation during large flood events.

6. **Construct floodwalls:** The JPA will construct floodwalls in the upper reach to increase capacity and maintain consistency with the California Department of Transportation's (Caltrans) enlargement of the U.S. 101/East Bayshore Road Bridge over the Creek (Caltrans facility) as follows:

    a. *East Palo Alto Floodwall:* Concrete floodwalls up to 4 feet above top of bank (up to 13 feet from channel bottom) will be constructed along approximately 2,350 linear feet (STA 52+00 to STA 77+50) of the Northern Levee; and

    b. *Palo Alto Floodwall:* Concrete floodwalls up to 4 feet above top of bank (up to 13 feet from channel bottom) will be constructed along approximately 2,879 linear feet (STA 51+00 to STA 77+50) of the Southern Levee.

7. **Install rock slope protection:** The JPA will install approximately 4,735 linear feet (5.86 acres) of rock-slope levee protection (RSP) at various locations along the length of the Project to protect the levee against erosion and to stabilize the floodwalls. The RSP on the levees will be installed from the toe of the levee up the bank approximately 10 to 15 feet.

8. **Construct Friendship Bridge boardwalk extension:** The JPA will construct a boardwalk extension to the Friendship Bridge. The existing Friendship Bridge will be retained and a 202-linear foot boardwalk will be constructed from the retained eastern footing of the bridge and across the newly-expanded Creek to connect with the realigned Southern Levee. The boardwalk will be the same width as the Friendship Bridge (140 feet long and 10 feet wide), constructed of timber deck and concrete piles, and require twenty 18-inch diameter concrete piles. The elevation of the low mark of the boardwalk will be set above the highest anticipated flood elevation, with the lowest point of the bridge a minimum of 5 feet above the marsh plain terrace beneath it. This Certification contains a condition prohibiting the use of chemically-treated wood on top of and inboard of the levees (i.e., in a location where it could discharge to State waters or otherwise impact beneficial uses, which are discussed in Finding D below), which applies to the boardwalk extension.

9. **Relocate portion of channel:** About 1,100 linear feet of the channel (C-line stations 43+00 to 54+00, as shown in the draft 100 percent design plans, will be relocated up to 80 feet to the east due to its existing close proximity to the proposed inboard levee toe. The final low flow channel alignment will be roughly equidistant between the Northern Levee and the new Southern Levee location and will have the same elevation as the existing channel elevation.

10. **Relocate or remove utilities:** The JPA will remove, abandon, or replace several utility components for electricity, gas, water, sanitary sewer, and stormwater runoff present within the Project right-of-way. This Certification requires, prior to the beginning of work, the JPA to prepare and submit an acceptable utility relocation plan that identifies, for example, appropriate measures to prevent impacts during horizontal directional drilling, proposed disposal locations or methods for excess sediment, elevations of live and abandoned utilities, and related information. In addition, the plan shall document the locations of any utilities abandoned in place.

    a. <u>Electricity and gas systems.</u> The JPA will coordinate with Pacific Gas and Electric (PG&E) to perform the following electricity and gas transmission system work before creek channel and levee construction work begins:

        i. *Electricity transmission system.* PG&E will realign the existing electricity transmission system that currently crosses over the Creek from L-line STA 52+00 (south bank) to R-line STA 48+00 (north bank). The new line will be shifted 250 feet south and cross over the Creek at L-line STA 51+00 (south bank) to R-line STA 52+00 on the north bank. The Project will include removing a pole from both banks; replacing two existing poles, one on each bank; and adding two new poles on the north bank for the new line. In addition, PG&E will remove wires from six poles that run north to south along the far north bank right-of-way between R-line STA 30+00 to STA 56+00. Of these six poles, one will be raised by 15 feet. The realigned section will connect to the southern-most pole in this series. Any replacement poles will be made of light-duty steel.

        PG&E will replace the foundation of an existing electric transmission tower located in the floodplain of the future channel alignment footprint at STA R-48+00, approximately 2,000 feet upstream of the Friendship Bridge. PG&E will demolish the existing foundation, build a temporary shoo-fly support, and build a permanent concrete foundation at the existing foundation site. The electricity tower on the old foundation will be lifted and placed onto the permanent concrete foundation with an area of 625 square feet. An access ramp will be built on the inboard side of the levee for this tower. This Certification includes a condition for the JPA to submit a utility plan that shall include elevations for all the new utilities.

        ii. *Gas transmission system.* PG&E will abandon in place 3,000 linear feet of the gas transmission line located in the Project right-of-way, of which about 1,350 linear feet is in the new channel realignment footprint. PG&E estimates that the old line is 4.7 feet below grade beneath the creek channel and will confirm the elevation during excavation activities. This Certification includes a condition requiring the JPA to remove the section of the existing gas transmission pipeline extending beneath the creek channel, floodplain, and levees, which is approximately 1,350 linear feet from the inboard top-of-bank of the Southern Levee to the inboard top-of-bank of the Northern Levee.

        The new gas line will be aligned south to north in the golf course, then will cross east to west through the Project right-of-way upstream of the Friendship Bridge from L-line STA 32+00 (south bank) to R-line STA 34+00 (north bank), and will extend west to a connection in East Palo Alto. The pipeline tunnel under the Creek will be bored by horizontal direction drilling at 25 feet below ground. The other portions of the pipeline will be installed by cut and fill at a minimum of 4 feet below ground surface.

        PG&E will place three trench spoils piles equidistant from south to north along the south bank. Each pile is planned to be 100 feet by 100 feet. On the north bank, PG&E will place another 100 foot by 100 foot spoils pile next to the borehole site. The suitability of the spoils for reuse to cover the new pipeline will be determined after they are appropriately assessed during the utility activities, and any unused spoils will be hauled from the site and appropriately disposed of at an approved upland facility.

b. *Sanitary sewer.* The JPA will realign a sanitary sewer line that currently crosses the Creek at the Friendship Bridge. As proposed, this task will involve open trenching with a minimum depth below ground surface of 3.5 feet for the new line. The sanitary sewer line would be encased in armored steel where it crosses the Creek. The new alignment will cross the creek at L-line STA 27+50 (south bank) through the channel at C-line STA 29+90 to R-line STA 27+60 (north bank). This work would be concurrent with the levee construction work so will not have separate impacts to waters of the State. The JPA will remove about 960 linear feet of existing sanitary sewer line. This Certification includes a condition requiring the JPA to submit information demonstrating that the line cannot be constructed at a deeper depth below the creek channel bottom or otherwise that there is not a reasonably foreseeable chance that the line could constrain the creek channel in the future.

c. *Storm drains and stormwater outfall.* The JPA will remove various storm drain pipelines existing within the golf course that will be under the future Southern Levee and widened creek channel post project. This work will be concurrent with the levee and channel work so will not have separate impacts to waters of the State. Caltrans plans to remove an abandoned 96-inch stormwater outlet within the Project area adjacent to the east border of the Project area (east of STA L-76; sheet C-47), as shown in the 100 percent design plans, sheet C-47, before the JPA begins Southern Levee construction activities.

11. **Dewatering:** The full length of the Project from Highway 101 to the mouth of the creek will be dewatered as discussed in the JPA's *Temporary Dewatering Plan* (October 14, 2014 draft). The Regional Water Board requires a Dewatering Plan to address diversion of surface water and management of groundwater seepage in construction areas.

    The Dewatering Plan states that at the end of each construction season, the JPA will remove all cofferdams, re-water the dewatered creek areas, and restore the creek habitat. The JPA will implement best management practices (BMPs) to avoid and minimize impacts to water quality and will analyze and monitor the water being returned to the creek channel to ensure the effectiveness of the BMPs.

    This Certification includes a condition requiring the JPA to revise the Dewatering Plan to address both surface water and groundwater management to ensure the proposed discharges meet applicable water quality objectives. The revised Dewatering Plan shall include a Surface Water Diversion Plan that describes, for example, the JPA's procedures for placing and removing coffer dams with minimal impacts to the Creek. The revised Dewatering Plan shall also include a Groundwater Management Plan that describes the BMPs that will be implemented to ensure groundwater flows are appropriately pumped, contained, and analyzed such that they meet applicable water quality objectives before discharging the flow back into the Creek downstream of the lower coffer dam.

12. **Sediment disposal and fill import:** The JPA plans to excavate about 175,890 cubic yards of fill or sediment during the levee modification and channel widening activities. About 20 percent of this sediment will be hauled offsite. The JPA anticipates placing the other 80 percent of sediment in the adjacent golf course for use in a future golf course reconfiguration project being managed by the

City of Palo Alto. About 190,800 cubic yards of fill will be imported for use in raising levee elevations.

This Certification contains a condition for the JPA to characterize any sediment being hauled out of the Project area to determine the appropriately-permitted upland location for disposal or to determine if the sediment may be beneficially-reused for the Project or at another location. In addition, this Certification includes a condition for the JPA to characterize all imported fill material being used in the Project in accordance with the Dredged Material Management Office guidance document *Guidelines for Implementing the Inland Testing Manual in the San Francisco Bay Region* (Corps Public Notice 01-01, or most current version) and the Regional Water Board May 2000 staff report, *Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines*, or the most current revised version.

13. **Disposal of materials other than sediment or soil:** This Certification includes a condition for the JPA to dispose of any other waste materials in an appropriately-permitted upland location. This applies to materials such as, but not limited to, wooden utility poles, electric wires, and other utility components removed from the Project area.

14. **Staging, access, and haul routes:** The Project's staging, access, and haul routes are designated based on work on the north or south banks as follows:

    a. **North Bank**

       i. Site access and a construction staging area will be located at the end of O'Connor Street near the intersection with Daisy Lane in East Palo Alto. The haul route will be along O'Connor Street to Pulgas Avenue, East Bayshore Road, and Embarcadero Road to U.S. 101. This is the designated route for large vehicles, including dump trucks and flatbed trucks, in the City of East Palo Alto.

       ii. Site access and a construction staging area will be located at the end of Daphne Way at Jasmine Way in East Palo Alto. The haul route will be along Jasmine Way to Camelia Drive, Pulgas Avenue, East Bayshore Road, and Embarcadero Road to U.S. 101. Large vehicles, including but not limited to dump trucks and flatbed trucks, will be prohibited on Daphne Way and Jasmine Way. Further vehicle restrictions on Daphne Way and Jasmine Way may be required by the City of East Palo Alto and will be determined during development of the Project Traffic Plan.

       iii. Site access and a construction staging area will be located at the end of Verbena Drive at Abelia Way. The haul route will be along Verbena Drive to Camelia Drive, Pulgas Avenue, East Bayshore Road, and Embarcadero Road to U.S. 101. Large vehicles, including but not limited to dump trucks and flatbed trucks, will be prohibited on Verbena Drive and Camelia Drive. Further vehicle restrictions on Verbena Drive and Camelia Drive may be required by the City of East Palo Alto and will be determined during development of the Project Traffic Plan.

    b. **South Bank**

       i. Site access will be at the Palo Alto Pump Station, accessed from East Bayshore Road. The haul route will be along East Bayshore Road to Embarcadero Road and U.S. 101.

       ii. Site access will be at Geng Road between the Baylands Athletic Center and the Golf Course. The haul route will be along Geng Road to Embarcadero Road and U.S. 101.

D. Impacts

The San Francisco Bay Basin Water Quality Control Plan (Basin Plan) defines the beneficial uses of waters of the State. The Project will impact the Creek. The Basin Plan assigns the following beneficial uses to the Creek: Cold Freshwater Habitat (COLD), Fish Migration (MIGR), Fish Spawning (SPWN), Warm Freshwater Habitat (WARM), Wildlife Habitat (WILD), Water Contact Recreation (REC-1), and Noncontact Water Recreation (REC-2).

The Project will permanently fill 9.41 acres and temporarily disturb approximately 3.86 acres of waters of the State due to Project activities. These estimated Project impacts are itemized by habitat type in Table 1 below. This Certification includes a condition requiring the JPA to prepare a final mitigation and monitoring plan (MMP) that describes how the JPA will mitigate for permanent and temporary Project impacts.

Table 1 - Impacted Areas by Habitat Type

Habitats	Purpose of Impact	Permanent Impacts (acres)		Temporary Impacts (acres)		Total (acres)
		Area	Subtotal	Area	Subtotal	
Diked Marsh	South levee alignment; channel widening	2.86	2.88	0.02	0.21	**3.09**
	North side loss at base of improved levee	0.02		0.19		
Freshwater Pond	South levee construction; channel realignment	1.13	1.13			**1.13**
Freshwater Marsh	South levee construction; channel realignment	0.33	0.33			**0.33**
Tidal Salt Marsh	Sediment removal in creek channel	2.82	3.18	0.84	1.33	**4.51**
	Fill in low spot in Faber Tract Levee	0.35		0.16		
	Bay Levee degradation	0.01		0.33		
Tidal Channel/ Bay Waters	Channel realignment	0.9	0.9	2.32	2.32	**3.12**
Riparian	Channel widening; marsh plain creation	0.5	0.5			**0.5**
Rock Slope Protection	Project-wide stability for floodwalls, levees, and banks	0.49	0.49			**0.49**
TOTAL			**9.41**		**3.86**	**13.27**

The following list shows the linear feet of impacts from Project activities, where (P) is for permanent impact and (T) is for temporary impact:

- 5,775 linear feet of sediment excavation (T)
- 3,296 linear feet of Northern Levee (P)
- 2,728 linear feet of Southern Levee (P)
- 350 linear feet of Faber Tract Levee (P)
- 600 linear feet of Bay Levee (P)
- 1,100 linear feet of tidal channel relocation (P)

- 543 linear feet of rock slope protection (P)

E. Mitigation

This Certification requires the JPA to restore permanently-affected riparian and wetland/marsh habitat and other waters of the State onsite at a minimum mitigation-to-effect ratio of 2:1 and to restore temporarily-affected habitat at a minimum mitigation-to-effect ratio of 1:1 to ensure the Project results in no net loss and a long-term net gain in wetland area, function, and value. The ratio of 2:1 for permanent impacts and 1:1 for temporary impacts will apply as long as onsite construction of a mitigation activity is completed within 12 months of the date when the associated impact first occurs. This Certification requires the JPA to complete an additional 10 percent mitigation per year, on an areal basis, for the portion of mitigation not completed within the required 12-month period. This Certification includes a condition for the JPA to maintain a schedule to track actual Project activity start dates, and the start dates of impacts to waters of the State and the associated mitigations.

The JPA will mitigate for permanent and temporary Project impacts in accordance with the final MMP. The JPA submitted a draft MMP to the Regional Water Board, the Corps, the California Department of Fish and Wildlife (CDFW), the U.S. Fish and Wildlife Service (USFWS), and the National Marine Fisheries Service (NMFS) in October 2014.

F. Maintenance

The JPA delegated operations and maintenance within the Project area to the District and the City of East Palo Alto on November 20, 2014 (JPA Resolution 14.11.20). The JPA, in consultation with the District and the cities of East Palo Alto and Palo Alto, is considering also adding the City of Palo Alto to the delegation agreement, although the City of Palo Alto is already within the District's jurisdiction. Maintenance will be conducted in accordance with the San Francisquito Creek Flood Reduction, Ecosystems Restoration, and Recreation Project, San Francisco Bay to Highway 101, Operation & Maintenance Manual (October 2014; final document in progress) (O&M Manual) and be consistent with the District's Stream Maintenance Program. The revised O&M Manual shall cover site-specific work requirements within the Project area such as vegetation management; and repair of animal damage to levees, erosion sites, flood damage, and access and maintenance roads. This Certification includes a condition for the JPA to submit, or cause the operations and maintenance-delegated entities to submit, a revised O&M Manual.

G. California Environmental Quality Act Compliance

On October 25, 2012, the JPA, as lead agency, certified an Environmental Impact Report (EIR) for the Project in accordance with the California Environmental Quality Act (CEQA) (JPA Resolution Number 12-10-25A). The JPA submitted an endorsed Notice of Determination, dated July 25, 2013, indicating that the JPA would carry out or approve the Project (JPA Resolution Number 13-07-25) in compliance with CEQA (Project State Clearinghouse Number 2010092048). The Regional Water Board, as a responsible agency under CEQA, has considered the EIR and finds that it appropriately addressed the Project's reasonably foreseeable potential environmental impacts.

H. EcoAtlas

It has been determined through regional, State, and national studies that tracking of mitigation/ restoration projects must be improved to better assess the performance of these projects, following monitoring periods that last several years. In addition, to effectively carry out the State's Wetlands Conservation Policy of no net loss to wetlands, the State needs to closely track both wetland losses and mitigation/restoration project success. Therefore, this Certification requires that the JPA use the California Wetlands Form to provide Project information related to impacts and mitigation/restoration measures. An electronic copy of the form and instructions can be downloaded at: http://www.waterboards.ca.gov/sanfranciscobay/certs.shtml. Project information concerning impacts and mitigation/restoration will be made available at the web link: http://www.ecoatlas.org/regions/ecoregion/bay-delta/projects.

Certification and General Waste Discharge Requirements: I hereby issue an order certifying that any discharge from the Project will comply with the applicable provisions of CWA sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 303 (Water Quality Standards and Implementation Plans), 306 (National Standards of Performance), and 307 (Toxic and Pretreatment Effluent Standards) and with other applicable requirements of State law. This discharge is also regulated under State Water Resources Control Board Order No. 2003 - 0017 - DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification," which requires compliance with all conditions of this Certification. The following conditions are associated with this Certification:

1. The JPA shall construct the Project in conformance with the Project description provided in the Application. Any changes to Project design must receive Executive Officer approval before the changes are implemented.

2. All technical reports, plans, and related information required by this Certification shall be submitted acceptable to the Executive Officer. Any changes to plans accepted by the Executive Officer must be accepted in writing prior to implementation of the change(s).

3. Construction shall not commence on any phase of the Project until all required documents, reports, plans, and studies required in this Certification associated with that phase of the Project have been submitted to the Executive Officer or the Regional Water Board and found acceptable by the Executive Officer or the Regional Water Board.

4. During construction activities, the JPA shall minimize disturbance or removal of vegetation in accordance with the Application's Box 16: Avoidance of Impacts. The JPA shall stabilize the Project area by incorporating appropriate BMPs, including the successful reestablishment of native vegetation, to enhance wildlife habitat values and to prevent and control erosion and sedimentation.

5. No debris, soil, chemically-treated wood, cement, concrete, or washings thereof, oil or other petroleum products, or any other unauthorized construction related materials or wastes shall be allowed to enter into or be placed where it may be washed by rainfall or runoff into waters of the State. When operations are completed, the JPA shall remove any excess material from the work area and any areas adjacent to the work area where such material may be washed into waters of the State.

6. The use of chemically-treated wood on or anywhere between the Project's levees, such as for boardwalks, utility line supports, and signposts, is prohibited, unless the JPA submits a report acceptable to the Executive Officer prior to such use demonstrating that no feasible alternative exists. Additionally, to avoid the leaching of copper and other chemicals toxic to aquatic species into the water column and sediment, only piles consisting of inert materials shall be installed. These materials may include steel, concrete, untreated wood, composite, or reinforced plastic. The use of marine paints containing copper and/or tributyltin is prohibited, without exception.

7. The JPA shall not operate any equipment in stream channels or other waters where there is flowing or standing water. No fueling, cleaning, or maintenance of vehicles or equipment shall take place within any areas where an accidental discharge to waters of the State may occur.

8. All work performed within waters of the State shall be completed in a manner that minimizes impacts to water quality, beneficial uses, and wetland and riparian habitat along the Creek and the Bay.

9. This Certification does not allow for the take, or incidental take, of any special status species. The JPA shall use the protocols specified by CDFW, USFWS, NMFS, and the Corps to ensure that Project activities do not impact the beneficial uses of COLD, MIGR, WARM, WILD, and the Preservation of Rare and Endangered Species.

10. The JPA shall adhere to the Terms and Conditions and the Reasonable and Prudent Measures in the most current *Endangered Species Consultation* issued for the Project by NMFS and the *Conservation Recommendations in the Essential Fish Habitat Consultation* also issued for the Project by NMFS.

11. The JPA shall adhere to the Terms and Conditions and the Reasonable and Prudent Measures in the most current *Biological Opinion* issued for the Project by USFWS.

12. Project construction activities shall be restricted to the time periods during the year and conditions allowed by the Corps, BCDC, USFWS, NMFS, and CDFW as specified in their permits, biological opinions, and agreements. Temporary extensions of the specified work periods may be granted upon receipt of written authorization from the applicable agencies and the Executive Officer.

13. Concrete used in the Project shall be allowed to completely cure (a minimum of 28 days) or be treated with a CDFW-approved sealant before it comes into contact with flowing water.

14. **Dewatering Plan.** Not later than 30 days prior to the commencement of dewatering activities, as discussed in Finding C.11, the JPA shall submit and implement a Dewatering Plan acceptable to the Executive Officer. The Dewatering Plan shall describe how the JPA will implement dewatering and rewatering activities for each creek reach in a manner that will be protective of the Creek's water quality and beneficial uses and will avoid exceedances of the applicable receiving water quality objectives including, but not limited to, turbidity, pH, temperature, dissolved sulfide, and dissolved oxygen. The Dewatering Plan shall include plans (i.e., diagrams or drawings; maps showing locations of activities and structure; and other design details as appropriate) for and appropriate discussion of all dewatering system components, such as diversion pipes, water storage, water quality monitoring, and discharge methods. In addition, the Dewatering Plan shall identify an appropriate discharge point for the proposed dewatering flows downstream of the lower coffer dam. The Dewatering Plan shall include, at a minimum, the following specific plans:

    a. *Surface Water Management Plan*. The JPA shall prepare and implement a Surface Water Diversion Plan as part of the Dewatering Plan. In addition to the general dewatering requirements discussed above, the Surface Water Diversion Plan shall include:

        i. procedures and methods for maintaining natural flow upstream and downstream of the Project area; for avoiding and preventing sedimentation and erosion upstream or downstream of the Project area; and for achieving discharge and receiving water quality objectives;

ii. methods for installing, maintaining, inspecting, and removing coffer dams with minimal or no impacts to the Creek. In addition, the plan shall describe how the Creek will be restored when coffer dams are removed after each construction season; and

iii. procedures for diverting the flow from two municipal storm drain pump stations that normally discharge into the Project area.

b. *Groundwater Management Plan.* The JPA shall prepare and implement a Groundwater Management Plan as part of the Dewatering Plan. At a minimum, the Groundwater Management Plan shall include detailed descriptions of the procedures for pumping, diverting, containing, and analyzing groundwater that upwells from trenching and other grading and excavation activities. In addition, the plan shall include:

i. a sketch of the approximate excavation and grading locations anticipated to generate groundwater needing to be managed during the construction activity;

ii. the purpose of each excavation activity where groundwater will be managed;

iii. anticipated depth and length of each excavation area;

iv. plans for containing and monitoring groundwater flow before discharging it to the Creek downstream of the lower coffer dam; and

v. identification of an appropriate discharge point for the proposed dewatering flows downstream of the lower coffer dam.

15. Creek dewatering discharges, accumulated groundwater or stormwater removed during dewatering of excavations, and diverted creek and stormwater flows shall not be discharged to waters of the State without meeting the following discharge and receiving water limitations:

a. Discharge pH - the instantaneous discharge pH shall be in the range of 6.5 to 8.5 and shall not vary from ambient pH by more than 0.5 pH units.

b. Discharge Dissolved Oxygen - the discharge dissolved oxygen concentration shall be no less than 5.0 milligrams per liter (mg/L) as an hourly average for discharging into tidal water and 7.0 mg/L (hourly average) for discharging into non-tidal receiving waters.

c. Discharge Dissolved Sulfide shall not be greater than 0.1 mg/L.

d. Receiving Water Turbidity - the receiving water turbidity measured as nephelometric turbidity units (NTU) shall not be greater than 10 percent of natural conditions in areas where natural turbidity is greater than 50 NTU (daily average). All Project discharge plans shall identify an acceptable location or locations at which to measure background turbidity. The JPA shall monitor receiving water and discharge turbidity at least one time every 8 hours on days when discharges from excavations or any other dewatering processes may occur.

e. Nutrients - the receiving waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.

f. There shall be no violation of any water quality standard for receiving waters adopted by the Regional Water Board or the State Water Resources Control Board.

16. No later than 60 days before the beginning of work, the JPA shall prepare and submit a utility relocation plan, acceptable to the Executive Officer, that identifies, at a minimum, appropriate measures to prevent impacts during horizontal directional drilling, elevations of live and abandoned utilities, proposed disposal locations or methods for excess sediment, proposed sediment reuse, and related information. In addition, the plan shall document the locations of any utilities abandoned in place.

17. No later than 60 days prior to commencing any drilling activity, the JPA shall submit boring plans acceptable to the Executive Officer. At a minimum, the boring plans shall include: a sketch of the approximate locations of drill entry and exit points; the proposed depth of bore(s) and a description of streambed conditions that supports the proposed depth of the bore; the approximate length of the proposed bores; type and size of boring equipment to be used; the estimated time to complete the bore; a list of lubricants and muds to be used; the name of the contractor and cell phone numbers of its construction supervisor and monitor; name of the environmental and biological monitor; site-specific monitoring conditions; monitoring protocols; and a containment and cleanup plan in the event of a discharge of drilling muds or other materials to a receiving water or to a location where they could be discharged to a receiving water.

    a. The JPA shall monitor drill mud pressure and volume at all times during drilling to ensure that hydrofracture or other loss of drill muds has not occurred. In the event of a sudden loss in pressure or volume, the JPA shall take appropriate steps, including immediately halting the drilling operation, to ensure that drilling muds are not discharged to waters of the State.

    b. Drilling within 50 feet of the creek channel shall only be performed when it is possible to visually monitor the creek bed for any indications of hydrofracture within the creek channel. In the event of any visual indication of hydrofracture, the JPA shall take appropriate steps, including immediately halting the drilling operation, to ensure that drilling muds are not discharged to waters of the State.

    c. All drilling muds, slurries, oils, oil-contaminated water, and other waste materials removed from the bore hole or otherwise used during the Project shall be disposed of at a permitted landfill, another appropriately-permitted site, or at an upland site approved in advance by the Executive Officer.

18. No later than 60 days prior to commencing the proposed relocation of the sanitary sewer line, the JPA shall submit a technical report, acceptable to the Executive Officer, that identifies the depth below the channel at which the sanitary sewer line is to be relocated and demonstrates that the line cannot be constructed at a deeper depth below the creek channel bottom, or otherwise that there is not a reasonably foreseeable chance that the line could constrain the creek channel in the future.

19. No later than 60 days prior to commencing the proposed abandonment of the PG&E gas transmission line the JPA shall submit a technical report, acceptable to the Executive Officer, that includes plans to remove the section of the PG&E gas pipeline to be abandoned that runs beneath the Project's creek channel from the inboard top-of-bank of the Southern Levee to the inboard top-of-bank of the Northern Levee. The JPA shall complete the utility line relocations and removals, or cause them to be completed, consistent with the accepted report.

20. Prior to placing any imported fill material at the Project area, including all placement of fill in areas below the top of bank, on levees, and at any other location where the fill is a discharge to or has the potential to discharge to the Creek or other waters of the State, the JPA shall submit a technical

report, acceptable to the Executive Officer, that the chemical concentrations in the imported fill soil are in compliance with the protocols specified in the following documents:

a. The Dredged Material Management Office (DMMO) guidance document, *Guidelines for Implementing the Inland Testing Manual in the San Francisco Bay Region* (Corps Public Notice 01-01, or most current version) (Inland Testing Manual) with the exception that the water column bioassay simulating in-bay unconfined aquatic disposal shall be replaced with the modified effluent elutriate test, as described in Appendix B of the Inland Testing Manual, for both water column toxicity and chemistry (DMMO suite of metals only); and,

b. The Regional Water Board May 2000 staff report, *Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines*, or the most current revised version. Regional Water Board staff shall review and approve data characterizing the quality of all material proposed for use as fill prior to placement of fill at any of the levee, marsh, or channel areas at the Project site. Modifications to these procedures may be approved on a case-by-case basis, pending the JPA's ability to demonstrate that the imported fill material is unlikely to adversely impact beneficial uses.

21. Prior to reusing any sediment spoils, the JPA shall characterize the material to ensure the chemical concentrations are in compliance with the guidance documents from the DMMO and Regional Water Board discussed in Condition 20. The JPA shall characterize any unused spoils to determine the appropriate disposal of the material at an approved upland facility. The JPA shall maintain hauling receipts for all sediment hauled from the Project area and make them available upon request by the Executive Officer.

22. The JPA shall obtain coverage under and comply with the statewide NPDES General Permit for Discharges of Stormwater Associated with Construction Activity (Order No. DWQ-2009-0009, as amended by Order Nos. 2010-0014-DWQ and 2012-006-DWQ) (Construction Stormwater Permit). As part of its compliance, the JPA shall:

a. Submit, no later than 30 days before starting Project construction activities, a Storm Water Pollution Prevention Plan (SWPPP), prepared consistent with the requirements of the Construction Stormwater Permit and acceptable to the Executive Officer;

b. Stabilize all exposed/disturbed areas within the Project area, including using effective erosion and sediment control BMPs throughout all phases of construction to prevent the discharge of sediment-laden runoff to waters of the State. At no time shall sediment-laden runoff be allowed to enter wetlands or other waters of the State. Erosion and sediment control BMPs shall be monitored before, during, and after each storm event. Repairs and improvements to erosion and sediment control BMPs shall be implemented as necessary to prevent erosion and the discharge of sediment to waters of the State;

c. Ensure that, prior to the start of the rainy season, disturbed areas of waters of the State and disturbed areas that drain to waters of the State are protected with correctly installed erosion control BMPs (e.g., jute, straw, coconut fiber erosion control fabric, coir logs, straw) and are revegetated with propagules (seeds, cuttings, divisions) of locally-collected native plants; and

d. Where areas of bare soil are exposed during the rainy season, use silt control measures where silt and/or earthen fill threaten to enter waters of the State. Silt control structures shall be monitored for effectiveness and shall be repaired or replaced as needed. Buildup of soil behind silt fences shall be removed promptly, and any breaches or undermined areas repaired immediately.

e. Prepare and implement a spill prevention and control plan to prevent any fuel or other equipment-related materials in the Project area from being discharged into the creek channel.

23. No later than 60 days after receiving all necessary permits, biological opinions, agreements, and other agency approvals from the Corps, USFWS, NMFS, CDFW, the Regional Water Board, and the Bay Conservation and Development Commission (BCDC), the JPA shall submit a final MMP, acceptable to the Executive Officer, that incorporates all modifications to the draft MMP that were necessitated by comments on the October 2014 draft MMP by the Regional Water Board, the Corps, USFWS, NMFS, and CDFW, and by conditions of the Corps, CDFW, the Regional Water Board, and BCDC permits for the Project. In addition, the final MMP shall be submitted not less than 60 days prior to commencement of Project construction.

The JPA shall restore permanently-affected riparian and wetland/marsh habitat and other waters of the State onsite at a minimum mitigation-to-effect ratio of 2:1 and shall restore temporarily-affected habitat at a minimum mitigation-to-effect ratio of 1:1 to ensure the Project results in no net loss and a long-term net gain in wetland area, function, and value. The ratio of 2:1 for permanent impacts and 1:1 for temporary impacts shall apply as long as onsite construction of a mitigation activity is completed within 12 months of the date when the associated impact first occurs. Should completion of mitigation construction be delayed for any reason beyond those deadlines, the JPA shall complete an additional 10 percent mitigation per year, on an areal or linear foot basis, as appropriate, on or adjacent to the Project site, for the portion of mitigation not completed within 12 months of impact occurrence. If additional mitigation on or adjacent to the Project site is not available, the JPA shall propose mitigation at an alternate site, and higher ratios than those prescribed above may apply based on the location, function, and value of the alternate site.

The JPA shall maintain a Mitigation-Impact Calendar to track Project activities including the start dates of impacts to waters of the State and the associated mitigation activities. The JPA shall make the Mitigation-Impact Calendar available for review by the Executive Officer upon request.

Consistent with the California Wetlands Conservation Policy, the Executive Officer shall require amounts of mitigation greater than the 10 percent per year addition as the mitigation is further offsite or out-of-kind relative to Project impacts. The additional mitigation shall be proposed, acceptable to the Executive Officer, as part of a revised MMP. As of the date of this Certification, Table 2 lists the minimum required amounts of mitigation for proposed Project impacts:

Table 2 - Minimum Mitigation Area Required Based on Impacts[1]

Habitat Type	Permanent Impacts		Temporary Impacts	
	Area (acres)	Mitigation Area Required	Area (acres)	Mitigation Area Required
Diked Marsh	2.88	5.76	0.21	0.21
Freshwater Pond	1.13	2.26		
Freshwater Marsh	0.33	0.66		
Tidal Salt Marsh	3.18	6.36	1.33	1.33
Tidal Channel/ Bay Waters	0.9	1.8	2.32	2.32
Riparian	0.5	1.0		

Rock Slope Protection	0.49	0.98		
TOTAL	**9.41**	**18.82**	**3.86**	**3.86**

Notes:

[1] The minimum mitigation areas are based on a mitigation-to-effect ratio of 2:1 for permanent impacts and 1:1 for temporary impacts.

24. Mitigation areas shall be monitored for a minimum of five years, or longer if necessary, until the mitigation performance and success criteria as specified in the MMP required above have been achieved. The JPA shall submit Annual Reports, acceptable to the Executive Officer, no later than January 31 following each year in which mitigation is monitored, until the mitigation habitat has been successfully established. The Annual Reports shall describe each year's monitoring results, compare these results to the previous years' monitoring results and annual performance and success criteria, and describe progress made towards meeting the approved final success criteria. If annual performance criteria are not met, the Annual Reports shall identify remedial actions that will be implemented to achieve the mitigation success criteria, acceptable to the Executive Officer. The annual mitigation monitoring and reporting activities, and remedial actions as necessary, shall continue until the approved mitigation success criteria have been achieved. In the event it is determined that the proposed success criteria cannot be achieved in a mitigation area, an alternative mitigation plan shall be proposed acceptable to the Executive Officer to supplement and/or compensate for the failed mitigation.

25. Not later than 30 days after successfully completing all the Project's compensatory mitigation, including meeting all mitigation success criteria, the JPA shall submit, acceptable to the Executive Officer, a Notice of Mitigation Monitoring Completion to Susan Glendening at sglendening@waterboards.ca.gov, or to the current Regional Water Board staff member assigned to the Project. The Notice of Mitigation Monitoring Completion shall reference CIWQS place ID number 757384. The JPA shall submit a comprehensive final mitigation monitoring report, acceptable to the Executive Officer, with the Notice of Mitigation Monitoring Completion. The final mitigation monitoring report shall clearly document: (a) the compensatory mitigation habitat has met the performance criteria specified in the final MMP, and (b) the completion date for mitigation habitat monitoring.

26. The JPA shall use the standard California Wetlands Form to provide Project information describing impacts and restoration measures no later than 14 days from the date of the final MMP approved pursuant to Condition 23. An electronic copy of the form can be downloaded at: http://www.waterboards.ca.gov/sanfranciscobay/certs.shtml. The completed form shall be submitted electronically to habitatdata@waterboards.ca.gov or shall be submitted as a hard copy to both (1) the Regional Water Board (see the address on the letterhead), to the attention of EcoAtlas, and (2) the San Francisco Estuary Institute, 4911 Central Avenue, Richmond, CA 94804, to the attention of EcoAtlas.

27. The JPA shall coordinate the development of final construction plans with the Corps, USFWS, NMFS, CDFW, and the Regional Water Board that are consistent with a joint approval of design features for all threatened and endangered species including Central Coast steelhead, salt mouse harvest mouse, and Ridgway's rail. The final plans shall include the approved MMP and specifications for marsh restoration. The marsh restoration specifications shall include elevations of marsh and floodplain terraces and associated plant species, channel stability treatments, and habitat treatments for each elevation as specified by a coordinated agreement among the above five agencies. Project construction shall be subject to a letter of final approval by the Executive Officer

contingent upon his/her receipt of letters from the above named agencies that the Project's final construction plans meet their joint requirements.

28. No later than 60 days prior to construction, JPA shall submit, acceptable to the Executive Officer, a Post-Construction Stormwater Management Plan to show how stormwater runoff from newly-created impervious surfaces will be diverted away from any water of the State in the Project area and not result in water quality impacts downgradient of the impervious surfaces. The Post-Construction Stormwater Management Plan shall be consistent with the Regional Water Board's Municipal Regional Stormwater Permit (Order No. R2-2009-0074, as amended by Order No. R2-2011-0083, and as may be subsequently amended or reissued) requirements for post-construction stormwater management for new or replacement impervious surfaces.

29. Should any levee or floodwall settle more than the design projections, the JPA shall expeditiously repair the structure(s) and provide repair reports describing elevation differences from the design and re-evaluate with the resource agencies how to address short term protection needs and long term structural improvements required to maintain public safety.

30. No later than 60 days after completing construction of the Project, the JPA shall submit an as-built report of the Project to the Regional Water Board, acceptable to the Executive Officer. The as-built report shall include revised Project plans showing the actual areas of temporary disturbance and permanent fill. The as-built report shall also describe fill removal activities undertaken to restore temporarily-impacted sites to their original condition. The as-built report shall be submitted either by email to staff or by uploading it to the Regional Water Board's FTP internet site. Instructions for uploading documents to the FTP internet site are available at http://www.waterboards.ca.gov/sanfranciscobay/publications_forms/documents/FTP_Discharger_Guide-12-2010.pdf. If the as-built report is submitted by uploading it to the FTP internet site, JPA shall notify the Regional Water Board case manager via email.

31. No later than 60 days after receiving all necessary permits, biological opinions, agreements, or other agency approvals, i.e., from the Corps, USFWS, NMFS, CDFW, the Regional Water Board, and BCDC, the JPA shall submit a revised Operations and Maintenance Manual, acceptable to the Executive Officer, that incorporates all modifications to the MMP that were necessitated by conditions of those permits, agreements, or other approvals. The revised Operations and Maintenance Manual shall conform to the following requirements:

    a. Be consistent with the District's Stream Maintenance Program.

    b. Clearly specify the responsibilities of the JPA and its delegates for operations and maintenance in accordance with Resolution 14.11.20 and any future resolutions the JPA may adopt to delegate or otherwise define operations and maintenance responsibilities.

    c. Clearly specify any mitigation actions that may be necessary for operations and maintenance activities, which may include, but not be limited to, addressing potential sedimentation and erosion and other impacts to ensure: (1) long-term habitat protection and enhancement; (2) flood protection performance; and (3) long-term sustainability of the creek channel and the creek-marsh interface along the Faber Tract Levee in face of sea level rise.

    d. The revised manual may cover regular creek channel operations and maintenance activities in the Project area.

e. The Operations and Maintenance Manual shall be updated at a minimum every five years to meet the strategies and actions necessary for potential impacts from global climate change, as discussed in the next condition, and to incorporate lessons learned from previous operations and maintenance activities.

32. The JPA shall submit, at least once every five years, a technical report proposing revisions to the Operations and Maintenance Manual, acceptable to the Executive Officer, and describe adaptive management strategies to be implemented, and a corresponding implementation schedule, designed for the continued healthy functioning of the creek channel within the Project area and the creek-marsh interface along the Faber Tract Levee. This technical report shall address the best balance for sediment and hydrology and landscape conditions for the creek channel and marsh in the context of sea level rise and other potential climate change impacts, such as changes in storm surges and the tidal prism, for the primary purpose of implementing long-term protection strategies for the endangered species dependent on the creek channel and marsh. The technical reports shall make recommendations to adjust the Project as necessary to manage potential future impacts based on the most current climate change science within each five-year cycle.

33. This Certification action is not intended and shall not be construed to apply to any discharge from any activity involving a hydroelectric facility requiring a Federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license unless the pertinent certification application was filed pursuant to Title 23 of the California Code of Regulations (23 CCR) subsection 3855(b) and that application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought.

34. This Certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to section 13330 and section 3867 of the California Water Code (CWC) and 23 CCR.

35. Certification is conditioned upon total payment of the full fee required in State regulations (23 CCR §3833). Payment of the full fee amount of $59,000 was received on March 12, 2013.

Please be aware that any violation of this Certification's conditions is a violation of State law and subject to administrative civil liability pursuant to CWC section 13350. Failure to meet any condition of a certification may subject the JPA to civil liability imposed by the Regional Water Board to a maximum of $5,000 per day of violation or $10 for each gallon of waste discharged in violation of this action. Any requirement for a report made as a condition to this action (i.e., condition numbers 14, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 28, 30, 31, and 32) is a formal requirement pursuant to CWC section 13267 (see Fact Sheet attached), and failure to submit, late submittals, and inadequate submittals, or falsification of technical reports is also subject to civil liability as described in CWC section 13268. We anticipate, should new information come to our attention that indicates a water quality problem with this Project, the Regional Water Board may issue waste discharge requirements pursuant to 23 CCR, section 3857.

Finally, the Regional Water Board recognizes that the JPA plans additional phases of flood management project work on the Creek. The Regional Water Board will not certify any subsequent phases unless the JPA develops and implements, in a timely manner acceptable to the Executive Officer, plans for using a stakeholder coordination team approach to project permitting. Such a team should be jointly formed by the JPA and State and federal regulatory and resource agencies and include interested public stakeholders. The goal of using such a stakeholder coordination approach would be to help ensure the timely development and implementation of a multi-objective project supported by local, State, and federal stakeholders. The JPA should consider facilitating meetings of such a team by a mutually-agreed upon neutral facilitator. Regional Water Board staff is available to assist the JPA in developing and implementing this permitting approach.

If you have any questions, please contact Susan Glendening at (510) 622-2462 or via email to sglendening@waterboards.ca.gov.

Sincerely,

Bruce H. Wolfe
Executive Officer

Attachment 1:

Fact Sheet - California Water Code, Section 13267

Cc: Kevin Murray, JPA, kmurray@JPA.org
Greg Stepanicich, Esq., JPA, gstepanicich@rwglaw.com
Melanie Richardson, SCVWD, MRichardson@valleywater.org
Bill Springer, SCVWD, bspringer@valleywater.org
Luisa Valiela, U.S. EPA, valiela.luisa@epamail.epa.gov
Melissa Scianni, U.S. EPA, Scianni.Melissa@epa.gov
Jason Brush, U.S. EPA, R9-WTR8-Mailbox@epa.gov
Lisa Mangione, Corps, Lisa.Mangione@usace.army.mil
Gary Stern, NMFS, Gary.Stern@noaa.gov
Amanda Morrison, NMFS, Amanda.Morrison@noaa.gov
Anne Morkill, USFWS, anne_morkill@fws.gov
Joseph Terry, USFWS, joseph_terry@fws.gov
Cay Goude, USFWS, cay_goude@fws.gov
Joy Albertson, USFWS, joy_albertson@fws.gov
Melisa Amato, USFWS, melisa_amato@fws.gov
Brenda Blinn, CDFW, Brenda.blinn@wildlife.ca.gov
Tami Schane, CDFW, Tami.Schane@wildlife.ca.gov
SWRCB-DWQ, Bill Orme Stateboard401@waterboards.ca.gov
Bob Batha, BCDC, bobb@bcdc,ca.gov
Brad McCrea, BCDC, bradm@bcdc.ca.gov

Fact Sheet – Requirements for Submitting Technical Reports Under Section 13267 of the California Water Code

What does it mean when the Regional Water Board requires a technical report?
Section 13267 of the California Water Code provides that "…the regional board may require that any person who has discharged, discharges, or who is suspected of having discharged or discharging, or who proposes to discharge waste...that could affect the quality of waters...shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires."

This requirement for a technical report seems to mean that I am guilty of something, or at least responsible for cleaning something up. What if that is not so?
The requirement for a technical report is a tool the Regional Water Board uses to investigate water quality issues or problems. The information provided can be used by the Regional Water Board to clarify whether a given party has responsibility.

Are there limits to what the Regional Water Board can ask for?
Yes. The information required must relate to an actual or suspected or proposed discharge of waste (including discharges of waste where the initial discharge occurred many years ago), and the burden of compliance must bear a reasonable relationship to the need for the report and the benefits obtained. The Regional Water Board is required to explain the reasons for its request.

What if I can provide the information, but not by the date specified?
A time extension may be given for good cause. Your request should be promptly submitted in writing, giving reasons.

Are there penalties if I don't comply?
Depending on the situation, the Regional Water Board can impose a fine of up to $5,000 per day, and a court can impose fines of up to $25,000 per day as well as criminal penalties. A person who submits false information or fails to comply with a requirement to submit a technical report may be found guilty of a misdemeanor. For some reports, submission of false information may be a felony.

Do I have to use a consultant or attorney to comply?
There is no legal requirement for this, but as a practical matter, in most cases the specialized nature of the information required makes use of a consultant and/or attorney advisable.

What if I disagree with the 13267 requirements and the Regional Water Board staff will not change the requirement and/or date to comply?
You may ask that the Regional Water Board reconsider the requirement, and/or submit a petition to the State Water Resources Control Board. See California Water Code sections 13320 and 13321 for details. A request for reconsideration to the Regional Water Board does not affect the 30-day deadline within which to file a petition to the State Water Resources Control Board.

If I have more questions, whom do I ask?
Requirements for technical reports include the name, telephone number, and email address of the Regional Water Board staff contact.

1 All code sections referenced herein can be found by going to www.leginfo.ca.gov.

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
BAY DELTA REGION
7329 SILVERADO TRAIL
NAPA, CALIFORNIA 94558
(707) 944-5500

STREAMBED ALTERATION AGREEMENT
NOTIFICATION NO. 1600-2013-0092-R3
SAN FRANCISQUITO CREEK

MR. KEVIN MURRAY
San Francisquito Creek Flood Reduction, Ecosystem Restoration and Recreation Project

This Streambed Alteration Agreement (Agreement) is entered into between the California Department of Fish and Wildlife (CDFW) and the San Francisquito Creek Joint Powers Authority (Permittee), as represented by Kevin Murray.

RECITALS

WHEREAS, pursuant to Fish and Game Code (FGC) section 1602, Permittee notified CDFW on March 15, 2013 that Permittee intends to complete the project described herein.

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

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

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

PROJECT LOCATION

The project is located along San Francisquito Creek, on the eastern edge of East Palo Alto, in southeastern San Mateo County and northwestern Santa Clara County, in the State of California. The Palo Alto Municipal Golf Course (Golf Course) and Palo Alto Airport are adjacent to the eastern and southern boundaries of the project site. The project area can be accessed from East Bayshore Road (on the northeastern side of Highway 101). The project is located at Latitude 37.453057 N, Longitude -122.127577 W on the Palo Alto U.S.G.S Quadrangle Map, and at Latitude 37.453057 N, Longitude -122.115942 W on the Mountain View U.S.G.S Quadrangle Map.

The project area is shown in Exhibit A. Within this Agreement, the right bank will refer to the San Mateo County (East Palo Alto) side of the creek, and the left bank will refer to the Santa Clara County (Palo Alto) side of the creek (from downstream to upstream).

PROJECT DESCRIPTION

The purpose of the project is to improve channel capacity for San Francisquito Creek flows, coupled with the influence of the San Francisco Bay tides, and including projected sea-level rise, from the downstream face of East Bayshore Road to San Francisco Bay. The goals of the project are to improve flood protection, habitat, and recreational opportunities with the following objectives: protect properties and infrastructure between East Bayshore Road and the San Francisco Bay from creek flows resulting from 100-year fluvial flood flows occurring at the same time as a 100-year tide that includes projected sea-level rise through 2067; accommodate future flood protection measures (e.g., possible bridge removals or modifications) that are expected to be constructed upstream of the project; enhance habitat along the project reach, particularly for threatened and endangered species; enhance recreational uses; and minimize operational and maintenance requirements.

Major project elements include installation of floodwalls in the upper reach downstream of East Bayshore Road, and levee setbacks and improvements to widen the channel and increase levee height and stability between East Palo Alto and the Golf Course. Project activities include excavating sediment deposits within the channel to maximize conveyance; constructing sheetpile floodwalls in the upper reach to increase capacity and maintain consistency with Caltrans' newly constructed enlargement of the U.S. 101/East Bayshore Road bridge over San Francisquito Creek; and rebuilding levees, degrading levees, and relocating a portion of the southern levee (left bank) to widen the channel to reduce the influence of tides and increase channel capacity. Other major project elements include the extension of Friendship Bridge via a boardwalk across new marshland within the widened channel, and marshplain creation and restoration. Project activities are anticipated to take place over two construction seasons.

Sediment Removal

A total of approximately 11,000 cubic yards (CY) of sediment will be excavated from the channel (not including the excavation that will occur as a result of construction of structural elements). Sediment will be excavated along approximately 2,200 linear feet of the left bank (Station L-Lines 31+50 to 53+50) and along approximately 2,600 linear feet of the right bank (Station R-Line 32+50 to 42+50, 50+50 to 62+50, and 66+50 to 70+50).

Flood Walls

Sheetpile floodwalls with tops measuring approximately 20 feet North American Vertical Datum (NAVD 88) in elevation will be constructed along portions of the right and left banks of the channel. The floodwalls will be constructed along the right bank at the following locations: 1) Station R-Line 54+00 to 75+54 (approximately 2,154 feet in length and between 10.5 feet and 13.4 feet in height above the channel bench); 2)

Station R-Line 30+40 to 31+60 (approximately 120 feet in length and 13 feet in height above the channel bench); and 3) Station R-Line 29+60 to 29+96 (approximately 36 feet in length and 15 feet in height above the channel bench). The floodwalls will be constructed along the left bank at the following locations: 1) Station L-Line 71+57 to 76+19 (approximately 462 feet in length and between 13.2 feet and 15 feet in height above the channel bench); and 2) Station L-Line 49+23 to71+05 (approximately 2,182 feet in length and between 11.5 feet and 12.4 feet in height above the channel bench).

Earthen Levees
Existing earthen levees measuring between 13.5 feet and 17.5 feet NAVD 88 in elevation will be enlarged to approximately between 17.8 feet and 19.5 feet NAVD 88 along portions of the right and left banks of the channel. The existing earthen levee on the right bank at Station R-Line 29+60 to 75+50 (measuring 4,590 feet in length, 65 feet in width at the toe, and 8 feet above the channel bench) will be modified from Station R-Line 29+60 to Station 54+00 (approximately 2,440 feet in length, 75 feet in width at the toe, and 12 feet above the channel bench). The existing earthen levee on the left bank at Station L-Line 23+10 to 72+50 (measuring 4,940 feet in length, 44-60 feet in width at the toe, and 8 feet above the channel bench) will be modified from Station L-Line 22+73 to 49+23 (approximately 2,650 feet in length, 82-94 feet in width at the toe, and 12 feet above the channel bench).

A portion of the earthen levee on the left bank (mentioned above) will be relocated inland to an area currently occupied by the Golf Course. This relocated levee will be moved up to approximately 103 feet further inland (away from the San Francisquito Creek channel) relative to the existing levee to increase channel capacity at the existing constriction point. Except for a section around the eastern footings of Friendship Bridge, the old levee will be removed and the area restored to marsh plain. The portion of the levee containing the Friendship Bridge footings will remain as an island (referred to in the design plans [labeled Draft 100% and dated July 2015] as Friendship Island).

Access Roads
Access roads, which will also serve as trails, will be constructed at the tops of the levee crowns on both the left and right banks. These access roads/trails will measure approximately16 feet in width, but may be narrowed down to 12 feet in width near structures and residences in order to maximize the stream width in these locations. Access roads/trails will be overlain with aggregate base and in some areas will also be paved with asphalt concrete.

Rock Slope Protection
Approximately 3.71 acres (6,276 linear feet) of rock slope protection (RSP) will be placed along portions of some of the levee tops and inboard levee slopes, as well as on the top and side slopes of Friendship Island.

Faber Tract Levee Stability Improvement

The project is separated from the Faber Tract of the U.S. Fish and Wildlife Service's (USFWS) Don Edwards Wildlife Refuge (Refuge) by an existing levee (Faber Tract Levee). The Faber Tract is known to contain a high density of Ridgway's rail (*Rallus obsoletus obsoletus*), and a likely population of salt-marsh harvest mouse (*Reithrodontomys raviventris*). To minimize impacts to the high quality habitat of the Faber Tract for these species, fill will be added to portions of the Faber Tract Levee to reduce concerns regarding levee erosion and the potential for mass levee failure. A 400-foot section of levee crest downstream of Friendship Bridge will be raised from a minimum elevation of 11 feet to 13 feet, and the marsh side of the Faber Tract Levee will be sloped 6H:1V into the Faber Tract marsh. The 6H:1V Faber Tract Levee side slope will help protect the levee toe from erosion due to flow overtopping a 400-foot distance as the Faber Tract Levee transitions to a higher elevation upstream near Friendship Bridge.

Friendship Bridge
The existing Friendship Bridge [measuring approximately 140 feet long, 11.5 feet wide, 15 feet high, with a freeboard water surface elevation (WSE) to soffit of 4.9 feet] will be retained and extended as a boardwalk from the retained eastern footing across the new marsh plain terrace to the relocated left bank levee. The abutments supporting Friendship Bridge will remain unchanged. Adjacent to the existing bridge on the left side of the creek, the project will include a marsh plain terrace that will be graded to an elevation equal to the mean higher high water (MHHW) tide elevation. This terrace will create a continuous tidal marsh beginning in the lower reach of the project, surrounding Friendship Bridge's southeast approach, and extending upstream along the creek's left bank. The terrace will be inundated during spring tides and more moderate stream flow events. The left end of Friendship Bridge will stand in the marsh plain terrace after the project is implemented. A boardwalk will traverse the marsh plain from the left bank and will tie into the abutment on the left end of Friendship Bridge. The boardwalk will be the same width (approximately 11.5 feet wide) as Friendship Bridge and measure approximately 202 feet long and 10 feet high. The boardwalk will have a freeboard WSE of 3.7 feet at the new levee, and 2.4 feet at Friendship Island (flows will be allowed over the boardwalk). The boardwalk will be constructed of a timber deck and 12 concrete piles (each measuring 18 inches in diameter). The elevation of the low mark of the boardwalk will be set above the highest anticipated flood elevation, with the lowest point of the bridge a minimum of 5 feet above the marsh plain terrace beneath it.

Bay Levee Degrade
Downstream of the Faber Tract, in a separate, lower-quality marsh area that is subject to daily tides from San Francisco Bay, approximately 600 feet an existing levee (referred to as the Bay Levee) separating the creek from this marsh area will be degraded from Station 3+50 to Station 9+50. This levee degrade will allow further connection of the marsh to the creek and decrease the WSE in the creek during large flood events, allowing the channel to expand out over the marsh area at a point further upstream than under existing conditions.

Dewatering
Water diversion will be implemented to maintain the work site as water-free as possible for the duration of in-channel work. The full width of the channel from the tops of bank will be dewatered. Water incursion is expected from San Francisco Bay tides, natural and urban runoff flows from upstream, outfalls downstream from the U.S. 101/East Bayshore Road bridge, and discharges from the O'Connor Pump Station in East Palo Alto and the Palo Alto Pump Station.

Water diversion will include cofferdams upstream (to intercept stream flows) and downstream (to block tidal Bay waters) of the work site. Stream flows upstream of the site will be pumped and passed through piping that bypasses the work site. Discharges from the two municipal pump stations will be pumped from the clear wells into the diversion piping. Dewatering sumps may be necessary for excavation, as depth to groundwater has been determined to be 1-3 feet below existing channel invert.

Utility Relocation
Project activities will require the relocation, removal, or raising of some of Pacific Gas and Electric's (PG&E) electric transmission towers (T) and poles, abandonment of existing and construction of new gas transmission lines, and realignment or relocation of sewer lines and storm drains.

T1 and T4 will be raised 15 feet. T2, which is currently located outside of the wetted portion of the stream channel, will be permanently removed. T3 will be relocated approximately 25 feet north of where T2 is currently located. Due to the fact that T3 will be within the creek channel once project construction is complete, there will be a fortified concrete pier (measuring approximately 625 square feet in area and 3 feet high) supporting each of the four legs of the tower placed into the newly widened channel. T3 will be 25 feet taller than T2. A temporary shoo-fly structure will be built to enable construction of T3. The shoo-fly structure will be supported by one wooden pole placed 25 feet south of the existing T2 and a second pole placed 75 feet north of the existing T2. The poles of the shoo-fly structure will be placed in the toe of the existing levee and will be removed once the new tower (T3) is fully operational.

Several utilities will be removed as a result of the relocation of the left levee into the Golf Course in the area of the Friendship Bridge extension. These utilities include a portion of an abandoned 24-inch sanitary sewer line, a portion of a 6-inch solid storm drain flex pipe, a portion of a joint trench (containing electrical and irrigation water), and a portion of a potable water line. Just upstream of Friendship Bridge, a 14-inch sanitary sewer line, which will be capped and plugged outside of the right of way on the right bank, crosses the channel to the left bank. This sanitary sewer line and associated vault will be removed.

A City of Palo Alto 96-inch diameter storm drain and outfall at Station L-line Station 76+00 will be relocated within the abutment for the Caltrans U.S. 101/Eat Bayshore Road Bridge and resized to 30 inches. A 30-inch diameter storm drain and outfall at

Station L-line 75+10 will be removed. A storm drain at the existing Santa Clara Valley Water District mitigation site Station C-Line 69+75 to 72+15 will be daylighted at the newly constructed bank (Station L-line Station 67+75). The storm drain and outfall at Station R-line 69+00 will be removed.

Portions of the existing PG&E gas transmission line (from Station R-line 50+50 to Station L-line 53+00) between the International School of the Peninsula and Friendship Bridge on both right and left banks are located within the realigned channel and will be removed. An approximately 1,350-foot length of abandoned PG&E gas transmission line that runs beneath channel from the right bank to the left bank will be removed (Station R-line 44+75 to Station L-line 53+00). A new 24-inch gas pipeline will be installed on the Palo Alto side of the creek (Station L-line 29+00). The pipeline will cross to the East Palo Alto side near Friendship Bridge (Station R-line 32+00), where it will tie in to the existing pipeline. The new pipeline will tie into the old pipeline at the electrical transmission tower east of the recreation area parking lot, at the end of Geng Road in Palo Alto. The new pipeline will extend northward on the left bank to the approximate location of Friendship Bridge just south of O'Connor Street. Between Geng Road and Friendship Bridge, the pipeline will lie within the Golf Course at a minimum of 15 feet east of the proposed new levee. At Friendship Bridge, the new pipeline will cross under the creek channel to the right bank, where it will tie into the existing pipeline. The tunnel for the new pipeline under the creek channel will be bored via horizontal directional drilling. The trench for the pipe on the left bank will be constructed by cut and fill. The pipeline will be located a minimum of 4 feet below grade.

Operation and Maintenance

Post-operation and maintenance activities beyond the term of this Agreement will be performed under the Santa Clara Valley Water District's Stream Maintenance Program (1600-2011-0336-R3). Post-construction operation and maintenance activities at the project site that may be performed during the term of this Agreement include mowing of approximately 6.49 acres of grassland habitat along the inboard face of the levees (except on the Faber Tract levee) up to three times per year, removal of invasive species from the restored tidal marsh, trash and debris removal, and burrowing rodent control.

Marshplain Creation and Restoration

Herbicides will be used to conduct the initial removal of invasive plant species prior to marshplain creation and restoration activities. Approximately 9.76 acres of tidal marsh will be created, and approximately 5.38 acres of tidal marsh will be passively restored as a result of this project.

Steelhead Passage Features

Six velocity refuge features (approximate locations shown in Exhibit A) will be installed within the project footprint in the San Francisquito Creek channel to improve steelhead (*Oncorhynchus mykiss*) passage. Features will include five rock and rootwad structures (constructed features including wood logs with and without rootwads and large rocks for anchoring) in the middle reach (upstream of Friendship Bridge) and one rock spur (partial weir) in the lower reach (immediately downstream of Friendship Bridge).

PROJECT IMPACTS

Existing fish or wildlife resources the project could substantially adversely affect include: the federally threatened Central California Coast steelhead; the federal candidate and state threatened longfin smelt (*Spirinchus thaleichthys*); the federally threatened and state species of special concern California red-legged frog (CRLF) (*Rana draytonii*), green sturgeon (*Acipenser medirostris*), and western snowy plover (*Charadrius alexandrinus nivosus*); the federally threatened and state fully protected black rail (*Laterallus jamaicensis coturniculus*); the federally endangered and state fully protected salt marsh harvest mouse (SMHM), California Ridgway's rail, San Francisco garter snake (SFGS) (*Thamnophis sirtalis tetrataenia*), and California least tern (*Sternula antillarum browni*); the fully protected white-tailed kite (*Elanus leucurus*); the state species of special concern western pond turtle (WPT) (*Actinemys marmorata*), western burrowing owl (BUOW) (*Athene cunicularia hypogea*), northern harrier (*Circus cyaneus*), San Francisco common yellowthroat (*Geothlypis trichas sinuosa*), and Alameda song sparrow (*Melospiza melodia pusillula*); other native and non-native fish species, and nesting birds.

Existing plant resources the project could substantially adversely affect include: the California Native Plant Society (CNPS) 1B.2 alkali milk-vetch (*Astragalus tener* var. *tener*), San Joaquin spearscale (*Atrixplex joaquiniana*), Congdon's tarplant (*Centromadia parryi* ssp. *condonii*), Point Reyes bird's beak (*Cordylanthus maritimus* ssp. *palustris*), and saline clover (*Trifolium depauperatum* ssp. *hydrophilum*); the CNPS 1A hairless popcorn flower (*Plagiobothrys glaber*); the CNPS 2B.2 slender-leaved pondweed (*Stuckenia filiformis*); and the Federally Endangered and CNPS 1B.1 California seablite (*Suaeda californica*).

The adverse effects the project could have on the fish or wildlife resources identified above, without implementation of the Measures to Protect Fish and Wildlife Resources specified below, include: permanent loss of natural bed or bank; channel profile widening; loss of bank stability during construction; increased bank erosion; accelerated channel scour; increased turbidity; changes in pH; short-term release of contaminants; short-term changes in dissolved oxygen, water temperature, and stream flow; dryback of stream channels; permanent loss of wetland vegetation; permanent decline in vegetative diversity; colonization by exotic plant species; change in stream flow; temporary impacts to stream due to dewatering activities; direct take of aquatic species from pumps; construction of trenches that can capture terrestrial and semi-aquatic organisms; temporary loss of wildlife connectivity to water source; temporary loss of terrestrial animal species' travel routes due to construction; disturbance or mortality of terrestrial, aquatic, and semi-aquatic fish and wildlife species; and disturbance to nesting birds.

Exhibit B shows a summary of permanent and temporary impacts to channel, wetland, and riparian habitat types. Exhibit C is a map showing the permanent and temporary impacts to the channel and various wetland types referenced in Exhibit B. The project will result in a total (both permanent and temporary) of approximately 3.13 acres of impacts to diked marsh which is found on the landward side of the levees and was likely tidal salt marsh historically (prior to the original construction of the levees) and supports vegetation typically dominated by saltgrass (*Distichlis spicata*), pickleweed (*Salicornia pacifica* and *S. virginica*), alkali heath (*Frankenia salina*), and Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*). The project will also result in a total of approximately 4.51 acres of impacts to tidal salt marsh which supports vegetation typically dominated by Pacific cordgrass (*Spartina foliosa*), pickleweed, perennial peppergrass (*Lepidium latifolium*), gumplant (*Grindelia stricta*), and alkali heath; and a total of approximately 2.43 acres of impacts to tidal channel and bay water habitat.

Approximately 0.57 acres of riparian habitat will be impacted by this project. Of approximately 114 trees to be removed, 48 trees are native, 59 trees are considered non-native and invasive, and 7 trees are considered non-native and ornamental. Exhibit D contains a tree removal map. Approximately fourteen of the native trees will be removed from an off-site riparian mitigation site that was required for project impacts associated with the Santa Clara Valley Water District's Matadero/Barron Creeks Long-Term Remediation Project (1600-2003-0119-R3). Approximately three of the native trees will be removed from a riparian mitigation site associated with the City of Palo Alto's Pump Station Project (1600-2007-0046-R3). These two existing mitigation sites are not protected under a Conservation Easement.

MEASURES TO PROTECT FISH AND WILDLIFE RESOURCES

1. Administrative Measures

Permittee shall meet each administrative requirement described below.

1.1 Documentation at Project Site. Permittee shall make the Agreement, any extensions and amendments to the Agreement, and all related notification materials and California Environmental Quality Act (CEQA) documents, readily available at the project site at all times and shall be presented to CDFW personnel, or personnel from another state, federal, or local agency upon request.

1.2 Providing Agreement to Persons at Project Site. Permittee shall provide copies of the Agreement and any extensions and amendments to the Agreement to all persons who will be working on the project at the project site on behalf of Permittee, including but not limited to contractors, subcontractors, inspectors, and monitors.

1.3 Notification of Conflicting Provisions. Permittee shall notify CDFW if Permittee determines or learns that a provision in the Agreement might conflict with a provision imposed on the project by another local, state, or federal agency. In that event, CDFW shall contact Permittee to resolve any conflict.

1.4 Project Site Entry. Permittee agrees that CDFW personnel may enter the project site at any time to verify compliance with the Agreement.

1.5 Notification of Commencement and Completion of Work. Permittee shall notify CDFW within 5 working days of beginning work and within 5 working days of completion of work within the stream channel for each construction season covered in this Agreement. Notification shall be made to Tami Schane, Environmental Scientist, by email (tami.schane@wildlife.ca.gov) or by phone (415) 831-4640.

1.6 Final Plans and Specifications. Permittee shall provide final construction plans and specifications to CDFW prior to construction. Permittee shall notify CDFW of any modifications to the project description as stated above. At the discretion of CDFW, project modifications may require an amendment or a new Streambed Alteration Agreement.

1.7 Unauthorized Take. This Agreement does not authorize the take, including incidental take, of any State or federally listed threatened or endangered species, or of species that are otherwise protected under FGC. Permittee may be required, as prescribed in the California and U.S. Endangered Species Acts, to obtain take coverage for State and federally listed species prior to commencement of the project. Any unauthorized take of listed species may result in prosecution and nullification of this Agreement.

2. Avoidance and Minimization Measures

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

2.1 Work Period. To avoid impacts to longfin smelt, green sturgeon and steelhead, dewatering shall begin no earlier than June 15 and extend no later than October 15 for each work season during the term of this Agreement. Construction activities outside of the stream channel shall be confined to the period between May 1 and October 15. Revegetation work in a given reach is not confined to this work period but shall be completed within the wet season following completion of the project in that reach. Requests for extensions to conduct work within the stream or adjacent marsh shall be coordinated with Tami Schane, Environmental Scientist, by email (tami.schane@wildlife.ca.gov) or by phone (415) 831-4640.

2.2 Work Period Modification. If Permittee needs more time to complete Project activities, work may be authorized outside of the work period and extended on a day-to-day basis by contacting Tami Schane, Environmental Scientist, by email (tami.schane@wildlife.ca.gov) or by phone (415) 831-4640, or the CDFW Bay Delta Regional Office by mail, or by phone (707) 944-5500.

If Permittee requests a work period extension, Permittee shall submit such a request in writing to the CDFW Bay Delta Regional Office. The request shall: i) describe the extent of work already completed; ii) detail the activities that remain to be completed; iii) detail the time required to complete each of the remaining activities; and iv) provide photographs of both the current work completed and the proposed site for continued work. The work period variance shall be issued at the discretion of CDFW. CDFW reserves the right to require additional measures to protect biological resources as a condition for granting the variance. CDFW shall have 10 calendar days to review the proposed work period variance.

2.3 Precipitation Forecasts. Precipitation forecasts shall be considered when planning construction activities. Construction activities shall cease and all necessary erosion control measures shall be implemented prior to the onset of substantial precipitation defined as 0.5 inch or more within a 24-hour period. Construction activities that are halted due to precipitation may resume when precipitation ceases and the National Weather Service 72-hour weather forecast indicates a 20% or less chance of precipitation. Weather forecasts shall be documented upon request by CDFW.

2.4 Dewatering. Work shall be performed in isolation from the flowing stream. The entire stream flow shall be diverted around the project work area using water-tight coffer dams and piping consistent with the Temporary Water Diversion Plan dated September 3, 2015, and received by CDFW in the submittal of additional information dated September 14, 2015, unless otherwise conditioned herein. Upon removal of the water diversion system, flows shall be gradually restored to the channel in a manner that avoids an erosive surge of water. Gravel-filled bags and plastic sheeting may be used to prevent leaking at the cofferdams. Sand-filled bags shall not be used at any time within the limits of the stream channel. The project site shall be dewatered using Baker tanks with a total capacity of 21,000 gallons for testing and appropriate discharge or disposal. Screened pumps shall be used in accordance with CDFW's fish screening criteria (http://www.dfg.ca.gov/fish/Resources/Projects/Engin/Engin_ScreenCriteria.asp).

2.5 Silt Curtain. A Type 3 Department of Transportation (DOT) floating silt curtain or CDFW-approved equivalent shall be installed on the outboard side of the Bay Levee during Bay Levee excavation, to prevent sediment from entering the adjacent marshland and San Francisco Bay. If it is possible to perform the Bay Levee excavation without entering the channel, the same type of floating silt curtain shall be installed on the channel side of the Bay Levee to prevent sediment from entering the channel.

2.6 No Equipment in Wetted Areas. Equipment shall not be operated in wetted areas, including but not limited to ponded, flowing, or wetland areas, or within the live stream channel below the level of top-of-bank.

2.7 Erosion Control. Erosion control measures shall be utilized throughout all phases of the project where sediment runoff from exposed slopes threatens to enter any stream channels. At no time shall silt laden runoff be allowed to enter any stream channels. To protect exposed soils from erosion during discharges, erosion control blankets, mats, or geotextiles shall be placed over the erodible surfaces. Any erosion control materials used within the stream channels during discharges shall be removed immediately upon completion of water discharges. No erosion control materials shall contain any plastic or monofilament netting.

2.8 CDFW-Approved Qualified Biologist(s) and Monitor(s). Permittee shall submit to CDFW for written approval, the names and resumes of all qualified biologists and biological monitors involved in conducting surveys and/or monitoring work.

A qualified biologist is an individual who shall have a minimum of five years of academic training and professional experience in biological sciences and related resource management activities with a minimum of two years conducting surveys for each species that may be present within the project area.

A biological monitor is an individual who shall have academic and professional experience in biological sciences and related resource management activities as it pertains to this project, experience with construction-level biological monitoring, be able to recognize species that may be present within the project area, and be familiar with the habits and behavior of those species.

2.9 Nesting Bird Surveys. If construction, grading, or other project-related improvements are scheduled during the nesting season of protected raptors and migratory birds January 15 to September 1, a focused survey for active nests of such birds shall be conducted by a qualified biologist within fourteen (14) days prior to the beginning of project-related activities. The results of the survey shall be sent to Tami Schane, Environmental Scientist, by email (tami.schane@wildlife.ca.gov) prior to the start of project activities. Refer to Notification Number 1600-2013-0092-R3 when submitting the survey results to CDFW. If an active nest is found, Permittee shall consult with the USFWS and CDFW regarding appropriate action to comply with the Migratory Bird Treaty Act (MBTA) of 1918 and the FGC of California. If a lapse in project-related work of 15 days or longer occurs, another focused survey and if required, consultation with CDFW and USFWS, shall be required before project work can be reinitiated.

2.10 Buffers. Active nests shall be designated as “Ecologically Sensitive Areas” and protected (while occupied) during project activities with the establishment of a fence barrier or flagging surrounding the nest site. If an active nest is found, the qualified biologist shall establish an appropriate buffer to be in compliance with the MBTA and Fish and Game Code 3503. The qualified biologist shall monitor the nesting birds and shall increase the buffer if the qualified biologist determines the birds are showing signs of unusual or stressed behavior by project activities.

Abnormal nesting behaviors which may cause reproductive harm include, but are not limited to, defensive flights/vocalizations directed towards project personnel, standing up from a brooding position, and flying away from the nest. The qualified biologist shall have authority to order the cessation of all nearby project activities if the nesting exhibit abnormal behavior which may cause reproductive failure (nest abandonment and loss of eggs and/or young) until an appropriate buffer is established. Typical minimum distances of the protective buffers surrounding each identified nest site is a 50-foot radius except for raptors, herons, and egrets; and a 300-foot radius around active nests for hawks, owls, herons, and egrets. All protective buffer zones shall be maintained, and no entrance shall be allowed into protective buffer zones, until the nest becomes inactive. If monitoring shows that disturbance of actively nesting birds is occurring, buffer widths shall be increased until monitoring shows that disturbance is no longer occurring. If this is not possible, work shall cease in the area until young have fledged and the nest is no longer active.

2.11 CRLF Survey. Prior to and within 48 hours of the planned start of project activities, a focused survey for CRLF shall be conducted by a qualified biologist to determine if they are present in the area. If CRLF individuals are found, CDFW and USFWS shall be notified immediately to determine the correct course of action and project activities shall not begin until approved by CDFW. CDFW may submit additional written avoidance, minimization and mitigation measures if CRLF are found within the project area. Those additional measures shall be considered part of this Agreement. CRLF shall not be relocated without authorization from USFWS.

2.12 SFGS Survey. Prior to and within 48 hours of the planned start of project activities, a focused survey for SFGS shall be conducted by a qualified biologist to determine if they are present in the area. If SFGS individuals are found, then work shall be stopped immediately by the qualified biologist, and the GGS shall be allowed to leave the work area on its own volition. CDFW shall be notified of any such occurrences. If the SFGS does not leave the area, then no work shall commence until CDFW has made a determination on how to proceed with work activities. The qualified biologist shall be present on site to monitor for this species during the operation of large equipment within 300 feet of freshwater pond areas. The qualified biologist shall have the authority to stop work if deemed necessary for any reason to protect SFGS.

2.13 WPT Survey. Prior to and within 48 hours of the planned start of project activities, a focused survey for WPT shall be conducted by a qualified biologist to determine if they are present in the area. If WPT individuals are found, CDFW shall be notified immediately to determine the correct course of action and project activities shall not begin until approved by CDFW. CDFW may submit additional written avoidance, minimization and mitigation measures if WPT are found within the project area. Those additional measures shall be considered part of this Agreement. In addition, Permittee shall notify CDFW in any instance where WPTs are relocated. Notification shall be made to Tami Schane, Environmental Scientist, by email (tami.schane@wildlife.ca.gov) or by phone (415) 831-4640.

2.14 WPT Exclusion. If WPT individuals are found, they shall be excluded from entering the project site. CDFW-approved exclusion fencing shall be installed around those areas or where equipment may be stockpiled. The lower edge of the fence shall be buried at least four (4) inches to prevent burrowing animals from tunneling under the fence.

2.15 Daily Species Inspection. If WPT individuals are found, after installation of the fence barrier, the biological monitor (or qualified biologist) shall conduct daily inspections of the project work area, and staging area prior to the commencement of construction activities. If the biological monitor or qualified biologist determines that sensitive species are not within the work area, equipment or materials may be moved onto the work site and project activities may commence under the direct observation of the biological monitor or qualified biologist.

2.16 BUOW. Permittee shall implement all conservation measures applicable to BUOW under the Santa Clara Valley Habitat Plan, including the BUOW Conservation Strategy. For any project activities located in grassland or bare ground habitat, Permittee shall survey the surrounding work area and associated grassland habitat to identify any nests sites and/or any BUOW foraging habitat. If there are BUOW nests on the project site, or if there are nests dependent on the grasslands on the project site, Permittee shall conduct an impact analysis to determine whether there will be any permanent impacts (permanent impacts under the BUOW Conservation Strategy are defined as those impacts where the site cannot be restored to pre-project conditions within one year) to BUOW nests or associated foraging habitat. If there are BUOW nests within 250 feet of project activities, Permittee shall establish a 250-foot radius, no work buffer zone around occupied BUOW nests. Buffers may be modified, with CDFW approval, by a qualified biologist based on location of paved roads, intervening riparian corridors, and levees.

2.17 California Ridgway's Rail, California Black Rail, and SMHM Survey. Prior to and within 48 hours of the planned start of project activities, a qualified biologist shall thoroughly inspect the work area and adjacent tidal or brackish marsh areas to determine if California Ridgway's rail, California black rail, or SMHM are present in these areas. If a mouse of any species, California Ridgway's rail, or California black rail is observed within the work area, then work shall be stopped immediately by the qualified biologist, and the mouse or rail shall be allowed to leave the work area on its own volition. CDFW shall be notified of any such occurrences. If the mouse or rail does not leave the area, then no work shall commence until CDFW has made a determination on how to proceed with work activities. The qualified biologist shall be present on site to monitor for these species during the operation of large equipment within 300 feet of brackish marsh areas. The qualified biologist shall have the authority to stop work if deemed necessary for any reason to protect California Ridgway's rail, California black rail, or SMHM.

2.18 <u>Work within California Ridgway's Rail, California Black Rail, and SMHM Habitat</u>. Project activities within or adjacent to habitat suitable for California Ridgway's rail, California black rail, or SMHM shall not occur within 2 hours before or after extreme high tides (6.5 feet or above) when the marsh plain is inundated.

2.19 <u>Vegetation Removal Within SMHM Habitat</u>. Vegetation removal within suitable habitat for SMHM shall be conducted by hand. Hand removal of vegetation shall start at the edge farthest from the largest contiguous salt marsh area and work its way towards the salt marsh, providing cover for SMHM and allowing them to move towards the salt marsh as vegetation is being removed.

2.20 <u>SMHM Exclusion Fencing</u>. In consultation with CDFW and USFWS, SMHM-proof exclusion fencing shall be placed around a defined work area immediately following vegetation removal and before proposed project activities begin. All supports for the exclusion fencing shall be placed on the inside of the work area to prevent SMHM from climbing the stakes into the work area. The SMHM-proof exclusion fencing shall be at least two feet high but no higher than 4 feet. The fencing shall be made of a heavy plastic sheeting material that is too smooth for SMHM to climb. The toe of the fence shall be buried approximately four inches in the ground to prevent SMHM from crawling or burrowing underneath it. A 4-foot buffer shall be maintained free of vegetation around the exclusion fencing and work areas. The final design and proposed location of the fencing shall be reviewed and approved by CDFW and USFWS prior to placement.

2.21 <u>Daily Site Inspection for SMHM</u>. Prior to initiation of work each day within 300 feet of tidal or pickleweed habitats, a qualified biologist shall thoroughly inspect the work area and adjacent habitat areas to determine if salt marsh harvest mice are present. The biologist shall ensure the exclusion fencing has no holes or rips, and the base remains buried. The fenced area shall be inspected daily to ensure that no SMHM are trapped.

2.22 <u>Mowing</u>. To minimize the possibility of injuring or killing SMHM during mowing activities associated with maintenance, mowing activities shall be preceded by cutting of vegetation with hand tools only. Once vegetation has been cut to a level such that the ground is clearly visible, mowing activities shall proceed with a biological monitor walking in front of the mower, scanning the area for any SMHM. Mowing shall be conducted in upland vegetation only and shall be prohibited in any marsh or marsh/transition zone vegetation.

2.23 <u>Burrowing Rodent Control</u>. Burrowing rodent (such as ground squirrel and gopher) control activities within 330 feet of marsh/brackish marsh habitat suitable for California Ridgway's rail or SMHM shall be limited to live trapping efforts only. All live traps shall have openings measuring no smaller than 2 inches (horizontal) by 1 inch (vertical) to allow any SMHM that inadvertently enter the trap to easily escape. All traps shall be placed outside of pickleweed areas and above the high tide line. Burrowing rodent control using rodenticides shall be limited to areas outside of known and potential habitat for California Ridgway's rail, California black rail, or SMHM. Any rodenticide use shall be limited to first-generation rodenticides only.

2.24 Stranded Aquatic Life. Permittee shall check daily for stranded aquatic life as the water level in the dewatering area drops. All reasonable efforts shall be made to capture and move all native fish observed in the dewatered areas. Capture methods may include fish landing nets, dip nets, buckets, electrofishing, and by hand. Captured native fish shall be released immediately in the closest body of water adjacent to the work site. For any species listed under the California Endangered Species Act or Federal Endangered Species Act, only a qualified biologist with the necessary permits issued by CDFW and/or National Marine Fisheries Service can supervise the relocation of listed species. Handling of said listed species shall be restricted solely to a qualified biologist with the necessary permits issued by CDFW and/or National Marine Fisheries Service. The Permittee shall contact CDFW no less than 24 hours and no greater than 72 hours of relocation activities. In the event that the Permittee intends to dispatch non-native fish species, Permittee shall coordinate with CDFW fisheries staff to apply for any applicable permits such as a permit to destroy nuisance fish (FG 793).

2.25 Steep-Walled Holes, Pits, and Trenches. All steep-walled holes, pits, or trenches exceeding 6 inches deep shall be secured against animal entry at the close of each day or any time the opening will be left unattended for more than one hour. Plywood or similar materials with no gaps shall be used to cover the trench (if possible), holes, and pit. In the absence of covers, escape ramps shall be provided, constructed of earth or untreated wood, sloped no steeper than 2:1, and located no further than 15 feet apart.

2.26 Pipes, Hoses, and Similar Structures. All pipes, hoses, or similar structures less than 12 inches in diameter shall be closed or covered to prevent animal entry. All construction pipes or similar structures greater than 2 inches in diameter stored at the project site overnight shall be inspected thoroughly for wildlife by a qualified biologist before the pipe or similar structure is buried, capped, used, or moved.

2.27 Herbicide Use. Only herbicides registered with the California Department of Pesticide Regulation shall be used. All herbicides shall be applied in accordance with regulations set by the California Department of Pesticide Regulation and used according to labeled instructions. Only herbicides and surfactants registered for aquatic use may be applied within the banks of the stream channel. Precautions shall be used to avoid contact of herbicide with native and non-target plant species. Use of herbicides within the banks of the stream channel shall be limited to the period between June 15 and October 15. There shall be no application of herbicide directly into water. Herbicide application shall not occur when wind conditions may result in drift. Herbicide solution shall be applied only until there is a wet appearance on the target plants to avoid runoff.

2.28 Staging of Materials. Staging and storage areas for vehicles, equipment, and any other materials shall be located outside of the stream channels and banks. Stationary equipment such as motors, pumps, generators, compressors, and welders, located within or adjacent to the stream channels shall be positioned over drip-pans. Any equipment or vehicles driven and/or operated within or adjacent to the stream channels shall be checked and maintained daily, to prevent leaks of materials that if introduced to water could be deleterious to aquatic life. Vehicles shall be moved a minimum of 65 feet away from any stream channels prior to refueling and lubrication.

2.29 Hazardous Materials. Debris, soil, silt, bark, rubbish, slash, sawdust, creosote-treated wood, raw cement/concrete or washings thereof, asphalt, paint, or other coating material, oil or other petroleum products, or any other substances which could be hazardous to aquatic life, resulting from project-related activities, shall be prevented from contaminating the soil and/or entering the waters of the State. Any of these materials, placed within or where they may enter a stream or lake, by Permittee or any party working under contract, or with the permission of the Permittee, shall be removed immediately. All chemicals stored in staging areas shall be stored in secondary containment with no less than 110% capacity. Proper storage and security shall be implemented to ensure that chemicals are not spilled or vandalized.

2.30 Frac-Out Contingency Plan. Permittee shall design, pre-plan and direct the horizontal directional drilling operations in such a way as to minimize the risk of spills of all types. At least 30 days prior to horizontal directional drilling operations, Permittee shall provide to CDFW for review and approval, a frac-out contingency plan to address the possibility of the release of drilling lubricants through fractures in the streambed or bank ("frac-outs"). The plan shall be on site at all times and all contractors shall have pre-arranged duties in case of a frac-out. Cleanup equipment shall be on site prior to the start of operations. In case of a frac-out, all drilling shall cease, and all personal shall implement the cleanup contingency plan. Operations shall not resume until the frac-out is located, contained, and cleaned up. CDFW shall be notified on every frac-out immediately. Notification shall be made to Tami Schane, Environmental Scientist, by email (tami.schane@wildlife.ca.gov) or by phone (415) 831-4640. Directional drilling shall not resume until approved by CDFW.

2.31 Drilling Mud. At no time shall drill cuttings, drilling mud, and/or materials or water contaminated with bentonite or any other substance deemed deleterious to fish or wildlife be allowed to enter the stream or be placed where they may be washed into the stream. Any contaminated water/materials from the drilling and/or project activities shall be pumped or placed into a holding facility and removed for proper disposal. Discharge or release of any contaminant, including drilling fluid, into a waterway is prohibited by Fish and Game Code 5650, except as authorized by Fish and Game Code 5650(b).

2.32 Spill Kits. Prior to entering the work site, all field personnel shall know the location of spill kits and trained in their appropriate use.

2.33 No Dumping of Litter or Debris. There shall be no dumping of litter or construction debris within the channel, riparian zone, or adjacent marsh. All litter, debris, and waste shall be picked up daily and properly disposed at an appropriate site.

2.34 Concrete Use Near Waterways. Poured concrete, including grout associated with rock riprap, and any runoff exposed to poured concrete shall be excluded from stream flows and the wetted channel for a minimum period of 30 days after it is installed. During that time the concrete shall be kept moist, and runoff from the concrete shall not be allowed to enter a waterway. Sealant or curing accelerant may be applied to the poured concrete surface or slurry where difficulty in excluding water flow from the uncured concrete surface for a long period may occur; however, pH testing of water exposed to uncured concrete shall be performed to ensure that the pH range shall remain between 6.5 and 8.3. Any sealant or accelerant to be used shall first have the material safety data sheets (MSDS) for all active chemical ingredients submitted and accepted by CDFW before application in construction. All MSDS shall include environmental toxicity information. If sealant is used, water shall be excluded from the site until the sealant is dry.

3. Compensatory Measures

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

3.1 Mitigation and Monitoring Plan. At least 30 days prior to the start of project activities, Permittee shall submit to CDFW for review and written approval, an updated Mitigation and Monitoring Plan (MMP) to replace the Draft MMP (*San Francisquito Creek Flood Reduction, Ecosystem, Restoration, and Recreation Mitigation and Monitoring Plan*, dated December 2015) that was submitted to CDFW via email on December 17, 2015. The updated MMP shall reflect the current project description, including an updated assessment of temporary, semi-permanent, and permanent impacts as described in this Agreement and associated Exhibits, and associated compensatory mitigation for each habitat type, such as habitat creation, restoration and levee enhancements. The updated MMP shall include revegetation details, including but not limited to, species composition, planting locations, plant palettes, hydroseeding methods, irrigation requirements, contingency measures, plant establishment periods, revegetation monitoring, performance standards, and success criteria for percent cover, survivorship, health and vigor ratings, and non-native vegetation cover. The planting plan for levee enhancements around the Faber Tract shall include linear feet and acreage of vegetation removal and planting; planting species palette; planting densities; and success criteria. The updated MMP shall also include a detailed description of mitigation associated with impacts to special-status species habitat such as invasive plant species removal, installation of passage features for steelhead, and upland refugia mounds in the Faber Tract for California Ridgway's rail.

3.2 Temporary, Semi-Permanent, and Permanent Impacts. CDFW defines temporary impacts as those impacts where habitat at the impact site can be fully restored to pre-project conditions, values, and functions within one year of impact. CDFW defines semi-permanent impacts as those impacts where habitat at the impact site can be fully restored to pre-project conditions, values, and functions within two years of impact. CDFW defines permanent impacts as those impacts where habitat at the impact site either cannot be restored, due to permanent removal of habitat, or where habitat at the impact site will require greater than two years to be restored to pre-project conditions, values, and functions relative to time of impact.

3.3 Temporary Wetland and Channel Impact Mitigation. Temporary impacts to 4.47 acres of wetland and channel habitat (0.80 acres of diked marsh, 1.33 acres of tidal salt marsh, and 2.34 acres of tidal channel), shall be compensated at a minimum ratio of 1:1. Passive restoration methods may be used if they will result in the site meeting the definition of a temporary impact per Measure 3.2. The updated MMP (refer to Measure 3.1) shall include measures to actively restore the site if passive restoration is not successful.

3.4 Permanent Wetland and Channel Impact Mitigation. Permanent impacts to 5.60 acres of wetland and channel habitat (2.33 acres of diked marsh, 3.18 acres of tidal salt marsh, and 0.09 acres of tidal channel), shall be compensated at a minimum ratio of ratio of 2:1 through the installation of 11.2 acres of tidal marsh plantings. Plantings shall include approximately 7.63 acres of native high marsh plantings, 6.64 acres of high marsh/transition zone plantings, and 0.87 acre of high marsh/transition zone seed mix. Permittee shall include a planting plan (including species palette, planting densities, and success criteria) in the updated MMP (see Measure 3.1).

3.5 Riparian Tree Mitigation. In consideration of the dominance of non-native and invasive species within the project impact area, the fact that riparian trees did not historically occur within the project area, and to minimize perching opportunities for avian predators in the salt marsh habitat, loss of native and non-native riparian trees shall be compensated by a combination of out-of-kind/on-site mitigation and in-kind/off-site mitigation. Loss of 0.57 acres of riparian habitat shall be mitigated out-of-kind and on-site at a 2:1 ratio with restoration of 1.14 acres of tidal wetland which historically occurred within the project area. To fully meet the mitigation required to compensate for the loss of riparian trees, trees shall also be replaced off-site at an appropriate location(s) as described in the updated MMP. The following tree replacement ratios shall apply:

3.5.1 Native tree species (except for oak) measuring 2-6 inches dbh shall be replaced with native tree species at a minimum ratio of 1:1 (trees replaced: trees impacted).
3.5.2 Native tree species (except for oak) measuring 7-30 inches dbh shall be replaced with native tree species at a minimum ratio of 3:1 (trees replaced: trees impacted).
3.5.3 Native tree species (except for oak) measuring greater than 30 inches dbh shall be replaced with native tree species at a minimum ratio of 5:1 (trees replaced: trees impacted).
3.5.4 Native oak trees measuring less than 13 inches dbh shall be replaced with similar native oak trees at a minimum ratio of 5:1 (trees replaced: trees impacted).
3.5.5 Native oak trees measuring 13-18 inches dbh shall be replaced with similar native oak trees at a minimum ratio of 8:1 (trees replaced: trees impacted).
3.5.6 Native oak trees measuring greater than 18 inches dbh shall be replaced with similar native oak trees at a minimum ratio of 10:1 (trees replaced: trees impacted).
3.5.7 Native trees removed from the mitigation sites associated with the Santa Clara Valley Water District's Matadero/Barron Creeks Long-Term Remediation Project and the City of Palo Alto's Pump Station Project shall be replaced at a minimum ratio of 6:1.

CDFW will consider installation of replacement tree plantings at an off-site location, to be described in the updated MMP and subject to CDFW approval. The updated MMP shall also include an updated assessment identifying the impacted riparian trees by species, dbh range, project element, and an updated planting plan (including species palette, planting densities, and success criteria).

3.6 Irrigation. Supplemental watering shall be used as necessary to establish and maintain plant growth in order to meet success criteria. Irrigation shall be done in the most water efficient manner possible, such as using hand watering, drip/micro-irrigation, or through the use of a time release system.

3.7 Phytophthora. Permittee shall implement measures to avoid using plant stock that may be infected with the plant pathogen *Phytophthora* sp. Measures to avoid contamination with *Phytophthora* sp. may include, but are not limited to, avoiding collection of propagules from 1) known or likely infected areas; 2) during wet conditions; 3) when soil is muddy; or 4) from within 0.5 meters of the soil surface. Measures may also include implementing heat or chemical treatments to collected seeds prior to installation. Such measures shall be included in the planting plan in the updated MMP that shall be submitted to CDFW for review and approval (see Measure 3.1).

4. Reporting Measures

Permittee shall meet each reporting requirement described below.

4.1 Annual Monitoring Report. Permittee shall provide to CDFW an annual monitoring report by February 1st of each year of monitoring until CDFW provides approval in writing that the Permittee's final mitigation success criteria have been achieved. The first annual monitoring report shall be due the first year after project completion.

CONTACT INFORMATION

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

To Permittee:

Kevin Murray
San Francisquito Creek Joint Powers Authority
615 B Menlo Avenue
Menlo Park, CA 94025
Phone (650) 324-1972
kmurray@sfcjpa.org

To CDFW:

Department of Fish and Wildlife
Bay Delta Region
7329 Silverado Trail
Napa, CA 94558
Attn: Lake and Streambed Alteration Program – Tami Schane
Notification #1600-2013-0092-R3
Fax (415) 831-4640 (call same number ahead of time to arrange fax time)
tami.schane@wildlife.ca.gov

LIABILITY

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

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

SUSPENSION AND REVOCATION

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

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

ENFORCEMENT

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

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

OTHER LEGAL OBLIGATIONS

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

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

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

AMENDMENT

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

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

TRANSFER AND ASSIGNMENT

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

The transfer or assignment of the Agreement to another entity shall constitute a minor amendment, and therefore to request a transfer or assignment, Permittee shall submit to CDFW a completed CDFW “Request to Amend Lake or Streambed Alteration” form and include with the completed form payment of the minor amendment fee identified in CDFW’s current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

EXTENSIONS

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

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

EFFECTIVE DATE

The Agreement becomes effective on the date of CDFW’s signature, which shall be: 1) after Permittee’s signature; 2) after CDFW complies with all applicable requirements under the California Environmental Quality Act (CEQA); and 3) after payment of the applicable FGC section 711.4 filing fee listed at http://www.wildlife.ca.gov/habcon/ceqa/ceqa_changes.html.

TERM

This Agreement shall expire on December 31, 2020 unless it is terminated or extended before then. All provisions in the Agreement shall remain in force throughout its term. Permittee shall remain responsible for implementing any provisions specified herein to protect fish and wildlife resources after the Agreement expires or is terminated, as FGC section 1605(a)(2) requires.

EXHIBITS

The documents listed below are included as exhibits to the Agreement and incorporated herein by reference.

Exhibit A. (Figure 1 – Proposed Project Elements)
Exhibit B. (Summary Table)
Exhibit C. (Figures 1a-1d - Impacts to Wetlands and Other Waters)
Exhibit D. (Tree Removal Map)

AUTHORITY

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

AUTHORIZATION

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

CONCURRENCE

The undersigned accepts and agrees to comply with all provisions contained herein.

FOR SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

_______________________________ _______________

Kevin Murray
Project Manager

Date

FOR DEPARTMENT OF FISH AND WILDLIFE

Craig Weightman
Environmental Program Manager

Date

Prepared by: Tami Schane
Environmental Scientist

Date Submitted: December 28, 2015
Date Revised: February 3, 2016

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue Room 325
Santa Rosa, California 95404

DEC 3 0 2015

Refer to NMFS No: SWR-2013-9572

Lieutenant Colonel John C. Morrow
U.S. Department of the Army
San Francisco District, Corps of Engineers
1455 Market Street
San Francisco, California 94103-1398

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project near the cities of East Palo Alto and Palo Alto in San Mateo and Santa Clara counties, California (Corps file #2013-00030S).

Dear Colonel Morrow:

Thank you for your letter of April 26, 2013, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the U.S. Army Corps of Engineers' (Corps) proposed authorization for the San Francisquito Creek Joint Powers Authority to undertake the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project in San Mateo and Santa Clara counties, California, under Section 404 of the Clean Water Act of 1973, as amended (33 USC Section 1344 *et seq*.).

The enclosed biological opinion is based on our review of the proposed project and describes NMFS' analysis of potential effects on threatened Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) and threatened southern distinct population segment (DPS) of North American green sturgeon (*Acipenser medirostris*) and their critical habitat in accordance with section 7 of the ESA. In the enclosed biological opinion, NMFS concludes the project is not likely to jeopardize the continued existence of threatened CCC steelhead or southern DPS green sturgeon, nor is it likely to adversely modify their critical habitat. However, NMFS anticipates take of CCC steelhead will occur during project construction as juvenile steelhead are likely to be present during dewatering of the work site for construction. An incidental take statement which applies to this project with non-discretionary terms and conditions is included with the enclosed biological opinion.

This document also includes the results of our analysis of the action's likely effects on Essential Fish Habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Based on our review, NMFS concludes the proposed project would adversely affect EFH for species managed within the Pacific Coast Groundfish and Coastal Pelagic Species Fishery Management Plans. NMFS has included a conservation recommendation that can be taken by the action agency to avoid, minimize, or otherwise offset potential adverse effects on EFH. Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving EFH Conservation Recommendations.

Please contact Amanda Morrison, North-Central Coast Office in Santa Rosa, California at (707) 575-6083 or Amanda.Morrison@noaa.gov if you have any questions concerning this biological opinion or EFH response, or if you require additional information.

Sincerely,

, for

William W. Stelle, Jr.
Regional Administrator

Enclosure

cc: Gregory Brown, Corps Regulatory, San Francisco
Joseph Terry, US Fish and Wildlife Service, Sacramento
Tami Schane, California Department of Fish and Wildlife, Yountville
Susan Glendening, San Francisco Regional Water Quality Control Board, Oakland
Len Materman, San Francisquito Creek Joint Powers Authority, Menlo Park
Copy to ARN File # 151422SWR2013SR00116
Copy to Chron File

Endangered Species Act Section 7(a)(2) Biological Opinion
and Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project
San Mateo and Santa Clara Counties, California
(Corps File No. 2013-00030S)

NMFS Consultation Number: SWR-2013-9572

Action Agency: Army Corps of Engineers, San Francisco District

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Central California Coast steelhead (*O. mykiss*)	Threatened	Yes	No	No
North American Green Sturgeon (*Acipenser medirostris*)	Threatened	Yes	No	No

Fishery Management Plan That Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Groundfish	Yes	Yes
Pacific Coast Salmon	No	No
Coastal Pelagic	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By: for
William W. Stelle, Jr.
Regional Administrator

Date: December 30, 2015

LIST OF ACRONYMS AND ABBREVIATIONS

BA	Biological Assessment
BCDC	Bay Conservation and Development Commission
BMP	Best Management Practices
BOR	Federal Bureau of Reclamation
CDFW	California Department of Fish and Wildlife
Caltrans	California Department of Transportation
CCC	Central California Coast steelhead
Corps	U.S. Army Corps of Engineers
cy	cubic yards
cfs	cubic feet per second
DWR	California Department of Water Resources
DPS	distinct population segment
EFH	essential fish habitat
FMP	Fishery Management Plan
ft/s	foot per second
GCID	Glenn-Colusa Irrigation District
HCP	Habitat Conservation Plan
ITP	Incidental Take Permit
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MHHW	mean higher high water
MLLW	mean lower low water
MTL	mean tide level
mg/l	milligrams per liter
mm	millimeter
MMP	Mitigation and Monitoring Plan
NMFS	National Marine Fisheries Service
NTU	nephelometric turbidity units
O&M	Operations and Maintenance
PG&E	Pacific Gas and Electric
Refuge	U.S. Fish and Wildlife Don Edwards San Francisco Bay National Wildlife Refuge
RBDD	Red Bluff Diversion Dam
RSP	rock-slope protection
SFRWQCB	San Francisco Regional Water Quality Control Board
SFCJPA	San Francisquito Creek Joint Powers Authority
SCVWD	Santa Clara Valley Water District
SMP	Stream Maintenance Program
S-CCC	South-Central California Coast steelhead
SWRCB	State Water Resources Control Board
SHEP	Steelhead Habitat Enhancement Program
USFWS	U.S. Fish and Wildlife Service

TABLE OF CONTENTS

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into sections 2 and 3 below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available through NMFS' Public Consultation Tracking System (https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts). A complete record of this consultation is on file at the NMFS North-Central Coast Office in Santa Rosa, California.

1.2 Consultation History

November 8, 2011: NMFS attended a site visit along with staff from San Francisquito Creek Joint Powers Authority (SFCJPA), Santa Clara Valley Water District (SCVWD), and the U.S. Army Corps of Engineers (Corps).

April 26, 2013: NMFS received from the Corps the project's Biological Assessment (BA) (ICF International 2012) and the request for consultation on the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project (Project). In the initiation letter, the Corps determined the project may affect, but is not likely to adversely affect, threatened Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*) and threatened southern distinct population segment (DPS) of North American green sturgeon (*Acipenser medirostris*) and their critical habitat. Additionally, the Corps determined that the project would not have substantial adverse effects on EFH for various federally managed fish species within the Pacific Coast Groundfish, Pacific Coast Salmon, and Coastal Pelagic Species Fishery Management Plans (FMP).

May 13, 2013: NMFS sent an electronic message to the Corps commenting on the BA and requesting additional information on the proposed project. The message mentioned that the description of the project contained in the

BA did not contain sufficient detail for NMFS to assess the potential impacts of the project, and requested additional clarification on the project description (*i.e.*, dewatering activities and using heavy equipment in the channel).

February – July 2014: NMFS attended multiple interagency meetings regarding the project with staff from the U.S. Fish and Wildlife Service's (USFWS) Don Edwards San Francisco Bay National Wildlife Refuge (Refuge), the Corps, SCVWD, SFCJPA, California Department of Fish and Wildlife (CDFW), San Francisco Regional Water Quality Control Board (SFRWQCB), NMFS, and the Bay Conservation and Development Commission (BCDC) to discuss the various alternative configurations for the proposed project including filling in low spots in the Main Faber Marsh levee, degrading the Bay levee adjacent to Outer Faber Marsh near the mouth of San Francisquito Creek, and further setting back the levee into the Palo Alto Municipal Golf Course.

August 28, 2014: NMFS received from the Corps and SFCJPA the amended BA for the Project.

October 15, 2014: NMFS attended a site visit along with staff from SFCJPA, SCVWD, CDFW, and Corps. During the site visit NMFS was informed several additional documents regarding the project were available. These documents consisted of the Draft Mitigation and Monitoring Plan (MMP) (SFCJPA 2015c), Draft Operations and Maintenance (O&M) Plan (SFCJPA 2015a), and Temporary Water Diversion Plan (SFCJPA 2015b). NMFS received these documents from the SFCJPA on October 17, 2014.

November 3, 2014: NMFS sent a letter to the Corps and SFCJPA commenting on the August 2014 amended BA, the Draft MMP, and the Draft O&M Plan and requested additional information on channel capacity, sedimentation, and flooding, and fish passage and habitat. In this letter, NMFS also informed the Corps and SFCJPA that this information was necessary to complete the NMFS assessment of potential project impacts and conclude consultation.

April 24, 2015: NMFS attended a meeting with the Corps, SFRWQCB, SCVWD, and SFCJPA to discuss NMFS's comments and questions raised in the November 3, 2014, letter. The SFCJPA agreed to investigate the feasibility of, and provide to NMFS a conceptual proposal for incorporation of several project features (*i.e.*, velocity refuges and passive tidal marsh revegetation) to improve conditions for fish. The SFCJPA further agreed to provide: 1) updated planting plans and landscape sheets; 2) a table of wetlands impacts and mitigation calculations; 3) an updated MMP; 4) written responses to the points raised in the NMFS letter of November 3, 2014; and 5) HEC-RAS model results for existing conditions and proposed conditions. In addition, NMFS informed the Corps that the project may adversely affect ESA-listed species, critical habitat, and EFH and that a formal consultation will likely be necessary.

May – July 2015: NMFS received via electronic mail from SFCJPA the responses to NMFS's comments and questions raised in the November 3, 2014, letter and the additional information the SFCJPA agreed to provide at the April 24, 2015, meeting.

July - October 2015: NMFS participated in biweekly conference calls with SFCJPA, the Corps, USFWS, the Refuge, and SCVWD to discuss the information needed to complete the NMFS assessment.

July 30, 2015: During a biweekly conference call with the SFCJPA, Corps, USFWS, and SCVWD, NMFS requested the SFCJPA and SCVWD schedule a future, focused meeting among themselves, USFWS (Regulatory and Refuge), Corps, and NMFS to discuss a scenario in which certain elevations of marsh plain would be allowed to passively revegetate.

August 19, 2015 NMFS provided via electronic mail to SFCJPA and the Corps comments on the additional information provided by the SFCJPA between May and July 2015 (*e.g.*, additional hydraulic and hydrologic information).

August 26, 2015: NMFS participated in a conference call with SFCJPA and SCVWD to provide clarification on the additional hydrologic and hydraulic information NMFS requested on August 19, 2015.

September 3-24, 2015: NMFS received via electronic mail from SFCJPA updated versions of the Draft O&M Plan (SFCJPA 2015); Temporary Water Diversion Plan; Draft MMP; and hydraulic and hydrologic information.

September 24, 2015: NMFS participated in a conference call with SFCJPA, Corps, USFWS, and SCVWD to inform the Corps and SFCJPA that NMFS believes the information provided completes the consultation request package.

October 13, 2015: NMFS attended a meeting with SFCJPA, SCVWD, Corps, USFWS Regulatory, Refuge, and SFRWQCB to discuss the tidal marsh design elevations and revegetation activities. During the meeting NMFS requested that the SFCJPA modify the proposed tidal marsh elevations to increase tidal salt marsh complexity and enhance ESA-listed fish habitat. The SFCJPA and SCVWD agreed to consider modifications and follow-up with NMFS within two weeks.

October 20, 2015:	Via electronic mail to the SFCJPA, SCVWD, and Corps, NMFS requested additional hydrologic information (*e.g.*, HEC-RAS model results for the 1 percent, 5 percent, and 50 percent [March-June] exceedance flows).
November 5, 2015:	During the biweekly project update call, NMFS informed the SFCJPA and Corps that SFRWQCB Estuarine Geomorphologist, Christina Toms, spoke with NMFS on October 26, 2015, regarding modifications to the Project's marshplain designs. NMFS explained the SFRWQCB believed that a passive approach to creating channel complexity in the tidal salt marsh would not be successful in the action area due to intense fluvial influences and that alternative methods would need to be taken to enhance ESA-listed fish habitat, specifically adult fish passage conditions. NMFS informed the SFCJPA that they will provide a memo summarizing their analysis of the Project's impacts on fish habitat and recommendations on the types of habitat enhancements that would be needed to enhance fish habitat within two weeks. NMFS also confirmed that they could rush completion of the Opinion, with a goal of completing it by December 15, 2015.
November 23, 2015:	NMFS provided the Corps, SFCJPA, and other resource agency representatives a technical memo prepared by fish passage engineer, Dave White, which summarized the fish passage issues associated with high channel velocities under some streamflow conditions in the project reach, and suggested design elements to provide velocity refuge in the project reach.
November 30, 2015:	In response to recommendations provided in the NMFS November 23, 2015, fish passage review memorandum, the SFCJPA submitted to NMFS and the Corps a preliminary proposal for the location, number and type of steelhead migration features to be incorporated in to project.
December 1, 2015:	A telephone conference call with representatives of NMFS, SFCJPA, USFWS and SCVWD was held to discuss SFCJPA's proposed steelhead fish passage features. NMFS informed the group that the proposal will likely address the most significant high velocity areas by creating resting sites behind boulders and rootwads. The SFCJPA agreed to incorporate these features into the project and continue to work with NMFS to develop the specific designs for each feature.
December 2, 2015:	The SFCJPA provided a revised proposal for steelhead fish passage features based on the December 1, 2015, conference call with NMFS.

1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). The Corps proposes to issue a permit under Section 404 of the Clean Water Act of 1973 (33 U.S.C. Section 1344) to the SFCJPA to construct a 1.5 mile flood protection and habitat restoration project along San Francisquito Creek from San Francisco Bay to East Bayshore Road, near the cities of East Palo Alto and Palo Alto in San Mateo and Santa Clara counties, California (Figures 1-5). The SFCJPA is a regional government agency whose members include the Cities of Palo Alto, Menlo Park, and East Palo Alto, the San Mateo County Flood Control District, and the SCVWD. The purpose of the proposed activity is to improve flood protection (up to a 100-year flood flow event coupled with the influence of tides and projected sea level rise), restore and enhance habitat functions, and improve recreational opportunities within the project area. Major project elements include: levee setback and improvements, construction of floodwalls, extension of a pedestrian bridge, excavation of sediment deposits within the channel to maximize flood conveyance, relocation and removal of utilities, and revegetation of tidal marsh habitats. Construction of the project elements would likely take two years to complete. The project is scheduled to begin in 2016 and to be completed by 2018.

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). There are no interdependent or interrelated actions associated with the proposed action.

1.3.1. <u>Construct Floodwalls and Rebuild, Relocate, and Degrade Levees</u>

Approximately 5,650 linear feet of floodwalls will be constructed along the channel at the top of levees to increase flow capacity and maintain consistency with the California Department of Transportation's (Caltrans) enlargement of the U.S. 101/East Bayshore Road Bridge over the San Francisquito Creek. On the East Palo Alto side (north bank), concrete floodwalls up to 4 feet above top of bank (up to 13 feet from channel bottom) will be constructed along approximately 500 linear feet near Friendship Bridge (pedestrian bridge crossing the creek) (STA 28+00 to STA 33+00) (Figure 4) and along 2,300 linear feet of channel between Daphne Way (STA 52+50) and U.S. Highway 101/East Bayshore Road (STA 75+50) (Figure 5). On the Palo Alto side (south bank), sheetpile floodwalls up to 4 feet above top of bank (up to 13 feet from channel bottom) will be constructed along approximately 2,850 linear feet from Geng Road (STA 47+50) to Highway 101/East Bayshore Road Bridge (STA 76+00) (Figures 4 and 5).

Downstream of the floodwalls, the SFCJPA will rebuild the East Palo Alto Levee (northern levee) in its current location and relocate the Palo Alto Levee/Palo Alto Municipal Golf Course Levee (southern levee). Approximately 3,400 linear feet of the existing levee on the north side of the channel would be rebuilt to a greater strength and/or height from just downstream of Friendship Bridge (STA 21+00) (Figure 3) to Daphne Way (STA 55+00) to increase channel capacity (100-year water surface elevation). Approximately 55,000 cubic yards (cy) of fill will be used to reinforce and increase the height of the northern levee. Approximately 2,727 linear feet of the southern levee will be relocated and/or reinforced between the area just downstream of Friendship Bridge (STA 22+73) and the area just downstream of Geng Road (STA 50+00). A portion of the levee will be relocated up to 200 feet east into the Palo Alto Municipal Golf Course and raised to increase channel capacity. This set back of the southern levee will create space for a floodplain terrace. Approximately 84,700 cy of fill will be used for the southern levee relocation. The elevation increase of both the northern and southern levees varies by up to 4 feet based on existing conditions and the necessary modifications at each station.

The SFCJPA will build about 10,176 linear feet of maintenance roads on the newly raised and relocated levees. The maintenance roads will also serve as pedestrian/bicycle trails. The roads will be up to 16 feet wide and paved with crushed granite, except for a 2,658 section on the south bank (STA 27+50 through 54+08), that will be paved with asphalt as part of the Bay Trail.

The SFCJPA will raise and grade a portion of the currently unmaintained levee between the creek and the Faber Tract (Faber Tract Levee) closer to its original design elevation to stabilize the levee and preserve existing frequency, volume, and velocities of fluvial discharge to the Faber Tract to optimize conditions for USFWS protected species that inhabit the Faber Tract marsh. Fill will be added to reinforce and raise the Faber Tract Levee up to 2 feet along 550 linear feet (STA 21+00 to STA 26+50) to reduce concerns regarding levee erosion and the potential for mass wasting leading to levee failure. In addition, the SFCJPA will incorporate a 6H:1V levee side slope on the side sloping into the Faber Tract. The 6H:1V levee side slope will help protect the levee toe from potential erosion due to flow overtopping along a 400-foot distance as the levee transitions upstream to a higher elevation closer to the Friendship Bridge. Approximately 12,000 cy of clean imported fill will be used to reinforce and redesign the Faber Tract levee.

The SFCJPA will degrade a 600 linear foot section of the northern levee east of the Faber Tract (referred to as the Bay Levee) to restore the tidal-fluvial interface in the marsh area east of the Faber Tract and to reduce water surface elevations in the creek between Friendship Bridge and the Bay. About 2,820 cy of sediment/soil will be removed along 600 linear feet (0.73 acres) of the Bay Levee (STA 3+50 to 9+50) (Figure 3) downstream of the Faber Tract in a marsh area that is already subject to daily tides from the Bay.

1.3.2. Excavate Sediment and Install Rock Slope Protection

About 175,890 cy of sediment will be removed from along 5,775 linear feet of the creek channel and associated channel expansion area to increase creek capacity and to maximize conveyance. In-channel sediment will not be reused because it is unlikely to provide suitable material for levee embankment use.

The JPA will install approximately 4,000 linear feet (3.71 acres) of rock-slope protection (RSP) at various locations along the length of the channel side of the Project to protect the levees against erosion and to stabilize the floodwalls. The RSP on the levees will be installed from the toe of the levee up the bank approximately 10 to 15 feet.

1.3.3. Construct Friendship Bridge Boardwalk Extension

The existing Friendship Bridge will be retained and a 202 linear foot boardwalk will be constructed from the retained eastern footing of the bridge and across the newly-expanded marshplain to connect with the realigned southern levee. The boardwalk will be the same width as the Friendship Bridge (140 feet long and 10 feet wide), constructed of timber deck and concrete piles, and require twenty 18-inch diameter concrete piles. The elevation of the low mark of the boardwalk will be set above the highest anticipated flood elevation, with the lowest point of the bridge a minimum of 5 feet above the marshplain terrace beneath it.

1.3.4. Relocate or Remove Utilities

The SFCJPA will remove, abandon, or replace several utility components for electricity, gas, and sanitary sewer, and stormwater runoff present within the Project right-of-way. SFCJPA will remove various storm drain pipelines existing within the golf course and at the top of the current levees that will be under the future southern levee and widened creek channel post project. This work will be concurrent with the levee and channel work. The SFCJPA will realign a sanitary sewer line that currently crosses the creek near the Friendship Bridge (STA 32+00 at the south bank to 34+50 at the north bank). As proposed, this task will involve open trenching with a minimum depth below ground surface of 3.5 feet for the new line. The sanitary sewer line would be encased in armored steel where it crosses the creek. This work would be concurrent with the levee construction work so will not have separate impacts to waters of the San Francisquito Creek. The SFCJPA will remove about 390 linear feet of existing sanitary sewer line.

The SFCJPA will coordinate with Pacific Gas and Electric (PG&E) to perform electricity and gas transmission system work before creek channel and levee construction work begins. PG&E's work is considered part of the Project and will be covered under the Corps' 404 permit for the Project. PG&E will realign the existing electricity transmission system that currently crosses over the creek from STA 52+00 (south bank) to R-line STA 48+00 (north bank). The new line will be shifted 250 feet south and cross over the creek at STA 51+00 (south bank) to STA 52+00 on the north bank. A transmission pole will be removed from both banks; replacing two existing poles, one on each bank; and adding two new poles on the north bank for the new line. In addition, PG&E will remove wires from six towers that run north to south along the far north bank right-of-way between STA 30+00 to STA 56+00. Of these six towers, one will be raised by 15 feet. The realigned section will connect to the southern-most pole in this series. Any replacement poles will be made of light-duty steel.

PG&E will replace the foundation of an existing electric transmission tower located in the floodplain of the future channel alignment footprint at STA 48+00, approximately 2,000 feet upstream of the Friendship Bridge. PG&E will demolish the existing foundation, build a temporary shoo-fly support, and build a permanent concrete foundation at the existing foundation site. The electricity tower on the old foundation will be lifted and placed onto the permanent concrete foundation with an area of 625 square feet. An access ramp will be built on the inboard side of the levee for this tower.

PG&E will abandon in place 3,000 linear feet of the gas transmission line located in the Project right-of-way, of which about 1,350 linear feet is in the new channel realignment footprint. THE SFCJPA will remove the abandoned gas transmission lines. PG&E estimates that the old line is 4.7 feet below grade beneath the creek channel. The SFCJPA will confirm the elevation during excavation activities.

The new gas line will be aligned south to north in the golf course, then will cross east to west through the Project right-of-way upstream of the Friendship Bridge from STA 32+00 (south bank) to STA 34+00 (north bank), and will extend west to a connection in East Palo Alto. The pipeline tunnel under the Creek will be bored by horizontal direction drilling at 25 feet below ground. The other portions of the pipeline will be installed by cut and fill at a minimum of 4 feet below ground surface.

PG&E will place three trench spoils piles equidistant from south to north along the south bank. Each pile is planned to be 100 feet by 100 feet. On the north bank, PG&E will place another 100 foot by 100 foot spoils pile next to the borehole site. The suitability of the spoils for reuse to cover the new pipeline will be determined after they are appropriately assessed during the utility activities, and any unused spoils will be hauled from the site and appropriately disposed of at an approved upland facility.

1.3.5. Revegetation

The action area encompasses 4.34 acres of diked marsh wetlands, 0.33 acres of freshwater marsh wetlands, 112.26 acres of tidal salt marsh wetlands, 1.13 acres of freshwater pond, 22.39 acres of tidal channel and bay waters, and 0.37 acres of tidal pans. The project construction is anticipated to impact a total of 3.13 acres of diked marsh, 4.51 acres of tidal salt marsh habitat, and 2.43 acres of tidal channel and bay waters. The diked marsh community is found on the landward side of the levees along San Francisquito Creek and within the Golf Course; and the tidal salt marsh vegetation is found throughout the Faber Tract and along both sides of San Francisquito Creek. The Project will result in the removal of between 162 and 256 trees. Of the potential of 256 trees to be removed, 220 of these are on the south side of the creek and the remaining 36 are on the north side.

After levee construction is complete, the tidal marsh area would be terraced and revegetated with high-marsh plants appropriate to the elevation relative to tidal levels in accordance with the MMP for the Project (SCVWD 2014). The high-marsh (above mean higher high water) will be planted with include alkali weed (*Cressa truxillensis*), saltgrass (*Distichlis spicata*), alkali heath (*Frankenia salina*), marsh jaumea (*Jaumea carnosa*), and perennial pickleweed (*Salicornia pacifica* [*S. virginica*]). The high-marsh transition planting area will be planted with fat hen (*Atriplex patula*), alkali weed, saltgrass, alkali heath, gumweed (*Grindelia* spp.), marsh jaumea, and western marsh rosemary (*Limonium californicum*). Native marsh plants will be used to revegetate the terraced land. Plants appropriate to the high marsh will be planted near the stream channel. Plants native to marsh transition areas would be planted in areas more distant from the creek channel and in the upper half of the Project area as elevation gains. Approximately 19,600 high marsh and high marsh transition wetland plants and cuttings are planned for installation. Plants will be sourced from the San Francisquito Creek watershed and Baylands areas.

A temporary irrigation system will be installed for use during the planting and three-year establishment phase, in order to provide a back-up water supply to the newly-installed vegetation in the event of a period of drought during the winter or spring rainy season, and for irrigation as needed during the summer. Irrigation frequency is expected to be reduced as the site develops during the establishment phase. The supplemental irrigation ensures an adequate supply of moisture to the young plants until they are fully established in the site's soils.

Annual monitoring will be conducted over a 5-year period. Performance goals related to revegetation efforts will aid in determining if the site is progressing incrementally toward meeting the year-5 success criteria (SFCJPA 2015c). Year 5 monitoring will determine if the success criteria have been achieved. Monitoring will be overseen or conducted by a qualified biologist with experience in vegetation monitoring. Final success will not be considered to have been achieved until temporary irrigation has been off for at least two years. The specific performance goals and criteria that will be used to determine if all revegetation was successful will be described in a Final MMP.

1.3.6. Dewatering of the Project Area

The project area is located in a reach of San Francisquito Creek that is influenced by tides and freshwater flow from the San Francisquito Creek watershed. Therefore, both a stream flow and tidal diversion will be necessary to dewater the project area for construction purposes. Water diversion will be implemented to maintain the work site as water-free as possible for the duration of in-channel work. The full width of the channel from tops of bank will be dewatered. Water incursion is expected from Bay tides, natural and urban runoff flows from upstream, outfalls downstream from the U.S. 101/East Bayshore Road Bridge, and discharges from the O'Connor Pump Station in East Palo Alto and the Palo Alto Pump Station.

Water diversion will include cofferdams upstream (to intercept stream flows) and downstream (to block tidal Bay waters) of the work site. Stream flows upstream of the site will be pumped through pipes that bypass the work site. Discharges from the two municipal pump stations located adjacent to the creek will be pumped from the clear wells into the diversion pipes as well. In addition, water that is diverted from the channel during dewatering will be retained, tested, and treated, as necessary, in order to meet all water quality effluent limitations as specified in the SFRWQCB, San Francisco Bay Region, Basin Plan (Basin Plan). Diversion pipe flow velocity dissipaters will be installed downstream of the cofferdam on existing banks. Pumps will be used to dewater the work site. Pumps will be required to: 1) reroute water from the stream, which accumulates above the upstream cofferdam; 2) dewater the construction area above the downstream cofferdam or where ponded; and 3) to reroute outflow at each of the two municipal pump stations (see below).

The cofferdams will be installed for the in-channel construction period between June 15th and October 15th at various locations, depending on the construction element, during the two construction seasons (see Table 1). Utilities and levee construction and dewatering will be completed in one season, and floodwall construction the following season.

Table 1. Cofferdam locations (approximate).

Construction Element	Downstream Location/Cofferdam Height	Upstream Location/Cofferdam height
Utilities Downstream Levee Construction	STA 13+00/12 ft	58+00/8ft
Upstream Floodwall Construction	49+00/10 ft	Within 50 ft upstream of U.S. 101 West Bayshore Road Bridge/ 8 ft

Groundwater depths are anticipated to be in the range of 1 to 3 feet below existing channel invert, so dewatering sumps may be required for excavation and will be utilized as necessary.

Dewatering for the utility crossings, levee work, and floodwall construction will be performed with the installation of a 36-inch diameter bypass pipe from above the upstream cofferdam to below the downstream cofferdam to allow anticipated construction season streamflows to avoid contacting the work area. The downstream cofferdams will be installed first and during the lowest tide during normal construction hours. The upstream cofferdams will be installed during the minimum streamflow expected during normal working hours. Diversion pipes and pumps will be in place and operational before cofferdams are installed. Cofferdams will remain in place and functional throughout the in-stream construction periods. Cofferdams will be removed at annual cessation of in-channel work, and channel and bank will be restored to pre-construction condition.

Dewatering for the Bay Levee deconstruction will be achieved by a floating silt curtain on both sides of the Bay Levee (STA 4+50 to 10+00) to prevent sediment from entering the adjacent marshland, creek, and San Francisco Bay. The silt curtains will be resistant to wind and high water velocity.

Cofferdams will be constructed of steel sheet pile embedded no less than 15 feet below the channel invert, gravel bags, and plastic sheeting. The piles will be installed with a backhoe or hammer attached to a backhoe. Gravel bags will be stacked against the sheet piles to the desired height. Gravel material will be between 0.4 and 0.8 inch in diameter, and will be clean and free from clay balls, organic matter, and other deleterious materials. The gravel bags will be placed on top of the plastic sheeting, which will be laid upon the channel invert or bank to prevent leakage. The gravel bags will be arranged so that each layer of gravel bag placed will be staggered in pyramid-like fashion. After the final height has been reached, the original plastic sheeting will be placed on top of the sandbags. To hold the plastic sheeting in place, gravel bags will be placed above the top plastic sheeting.

Water collected from the dewatered reach between cofferdams will be discharged through municipal storm drains to the City of East Palo Alto's pump station adjacent to the channel (O'Conner Street Pump Station). Additional water from urban sources will also be routed to this pump station, which normally outflows to the work area. To prevent flows from the East Palo Alto and Palo Alto pump stations from entering the work area, outflows will be pumped from the wet wells directly to the channel downstream of the downstream cofferdam or join the pump station outflow pipe to the stream diversion pipe.

The SFCJPA will ensure SFRWQCB and State Water Resources Control Board (SWRCB) water quality standards for receiving waters will be met during creek dewatering discharges, dewatering of excavations, and diverting creek and stormwater flows. Specifically, the instantaneous discharge pH will be in the range of 6.5 to 8.5 and shall not vary from ambient pH by more than 0.5 pH units; the discharge dissolved oxygen concentration will be no less than 5.0 milligrams per liter (mg/L) as an hourly average for discharging into tidal water and 7.0 mg/L (hourly average) for discharging into non-tidal receiving waters; dissolved sulfide will not be greater than 0.1 mg/L; the receiving water turbidity measured as nephelometric turbidity units (NTU) will not be greater than 10 percent of natural conditions in areas where natural turbidity is greater than 50 NTU (daily average); and the receiving waters will not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.

The SFCJPA will identify an acceptable location or locations at which to measure background turbidity. Receiving water and discharge turbidity will be monitored at least one time every 8 hours on days when discharges from excavations or any other dewatering processes may occur.

1.3.7. Fish Collection and Relocation

Because the project will require water diversion and dewatering of work sites, fish within the project area will be collected and relocated in order to minimize their risk of being harmed or killed. The fish collection and relocation activities will be conducted by a NMFS/CDFW-approved biologist. Methods used to capture and relocate fish in the project area may include dip net and seine. Due to the high conductivity of brackish waters, electrofishing will not be used. The SFCJPA will submit a fish relocation plan to NMFS and CDFW for review no less than 90 days prior to beginning these activities for each phase of construction.

1.3.8. Operation and Maintenance

The SFCJPA has entered into a Construction Management Agreement with the SCVWD to designate the SCVWD as the lead agency responsible for project construction and post-project revegetation monitoring and management. The SFCJPA has also delegated responsibility for routine operation and maintenance of the Project, outside the scope of construction-related maintenance and monitoring activities, to the City of East Palo Alto and the SCVWD. Routine operations and maintenance include providing the proper care to levee embankments, floodwalls, channels, interior drainage system, and pump stations required for the efficient operation of the Project. The only operation and maintenance activity proposed by the SFCJPA as part of the Project is levee maintenance, vegetation management, and removal of trash and debris. The primary routine maintenance activities will consist of mowing levees to facilitate inspections, removal of trash and debris from the channel and channel benches, and control of burrowing rodents. Mowing will occur on the sides of the levee, which, on the inboard side of the levee, extend to the tidal marsh. Maintenance activities will be performed in accordance with the Best Management Practices Handbook (Attachment F to the SCVWD 2014-2023 SMP).

Additional future maintenance within the completed flood channel could include sediment removal, vegetation removal, levee repair, floodwall maintenance, removal of woody debris from the channel, repair of rock slope protection, maintenance of access roads, and repair and maintenance of outfalls and culverts. These activities, within specified limits and mitigation measures, are conducted as part of the SCVWD's Stream Maintenance Program (SMP). NMFS and the Corps completed formal section 7 consultation in 2014 on a 10-year (2014-2023) SMP conducted by SCVWD within stream channels of Santa Clara County, including San Francisquito Creek. A biological opinion was issued to the Corps on April 29, 2014 (See Section 2.3.3.2 for more detail). At this time, no maintenance activities outside the actions described above and outside the purview of SCVWD's SMP are anticipated.

1.3.9. Proposed Best Management Practices and Fish Protection Measures

Based on a fish passage analysis performed by NMFS, the SFCJPA proposes to install six structures in the flood control channel that are designed to provide velocity refuge for upstream migrating adult steelhead. Five of the structures will be constructed with rock and rootwads as a "constructed log jam". The sixth structure will be a rock spur structure extending from the lower tip of the Friendship Bridge Island into the low flow channel. All six structures will be placed in or adjacent to the low flow channel at approximately 300 feet intervals in the middle reach of the project. These structures will be designed to create velocity breaks and fish resting areas during high flow events and low tide conditions.

During project construction, operation and maintenance activities, the project will implement BMPs to avoid and/or minimize potential impacts to special-status species and their designated critical habitat. All activities will be performed in accordance with Best Management Practices Handbook (Attachment F to the SCVWD 2014-2023 SMP). The BMP handbook is a comprehensive document that includes minimization measures related to hazards and hazardous materials, hydrology and water quality, bank protection, stormwater management, discharge activities, grading and excavation, sediment removal and storage, vegetation management and removal, and other topics.

1.4 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

San Francisquito Creek Watershed drains approximately 47.5-square miles on the eastern side of the Santa Cruz Mountains. Major tributaries include Bear Creek, Corte Madera Creek, and Los Trancos Creek, which converge to form San Francisquito Creek. The project area has a Mediterranean climate, typical of the California's central coast, with cool, wet winters and a long, mild dry season. Rainfall in the winter averages approximately 35 inches per year, falling mainly between the months of October and March. Portions of the upper San Francisquito Creek watershed are perennial and support spawning and rearing habitat for CCC steelhead. Sections of the mainstem of San Francisquito Creek dry by late spring or early summer in most years (Launer and Spain 1998; Metzger 2002; Stokes 2006).

The action area consists of the lower 1.5 miles of San Francisquito Creek in an existing flood control channel and adjacent marsh areas. The action area encompasses 4.34 acres of diked marsh wetlands, 0.33 acres of freshwater marsh wetlands, 112.26 acres of tidal salt marsh wetlands, 1.13 acres of freshwater pond, 22.39 acres of tidal channel and bay waters, and 0.37 acres of tidal pans. The diked marsh community is found on the landward side of the levees along San Francisquito Creek and within the Golf Course; and the tidal salt marsh vegetation is found throughout the Faber Tract and along both sides of San Francisquito Creek. From upstream to downstream, the constructed channel flows southwest to northeast through the cities of East Palo Alto and Palo Alto. The proposed project is located between where U.S. Highway 101 crosses San Francisquito Creek at the border of southern San Mateo and northern Santa Clara counties and the confluence of San Francisquito Creek with San Francisco Bay. This 7700 linear foot reach of San Francisquito Creek is located in a moderately urbanized, low gradient area, historically occupied by extensive tidal marshes at the edge of San Francisco Bay. The project location experiences daily tidal fluctuations.

2. ENDANGERED SPECIES ACT CONSULTATION: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, Federal agencies must ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement (ITS) that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures and terms and conditions to minimize such impacts.

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

The adverse modification analysis considers the impacts of the Federal action on the conservation value of designated critical habitat. This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat.[1]

[1] Memorandum from William T. Hogarth to Regional Administrators, Office of Protected Resources, NMFS

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an “exposure-response-risk” approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.
- Reach jeopardy and adverse modification conclusions.
- If necessary, define a reasonable and prudent alternative to the proposed action.

For critical habitat, NMFS determines the range-wide status of critical habitat by examining the condition of its physical or biological features (also called “primary constituent elements” or PCEs) - which were identified when critical habitat was designated. Species and critical habitat status are discussed in section 2.2 of this biological opinion.

To conduct the assessment, NMFS examined an extensive amount of information from a variety of sources. Detailed background information on the biology and status of and critical habitat has been published in a number of documents including peer reviewed scientific journals, primary reference materials, and governmental and non-governmental reports. Additional information regarding the effects of the project’s actions on the listed species in question, their anticipated response to these actions, and the environmental consequences of the actions as a whole was formulated from the aforementioned resources referenced in the Consultation History section. Information was also provided in electronic mail messages and telephone conversations between April 2013 and November 2015. For information that has been taken directly from published, citable documents, those citations have been referenced in the text and listed at the end of this document.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species’ likelihood of both survival and recovery. The species status section also helps to inform the description of the species’ current “reproduction, numbers, or distribution” as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses

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(Application of the “Destruction or Adverse Modification” Standard Under Section 7(a)(2) of the Endangered Species Act) (November 7, 2005).

the current function of the essential physical and biological features that help to form that conservation value.

2.2.1. Species Description, Life History, and Status- CCC Steelhead

In this opinion, NMFS assesses four population viability parameters to help analyze the status of CCC steelhead and the population's ability to survive and recover. These population viability parameters are: abundance, population growth rate, spatial structure, and diversity (McElhany *et al.* 2000). NMFS has used the best available scientific and commercial information to determine the general condition of the population and factors responsible for the current status of the DPS.

The population viability parameters are used as surrogates for numbers, reproduction, and distribution; the criteria to be analyzed pursuant to the regulatory definition of jeopardy (50 CFR §402.02). For example, the first three parameters are used as surrogates for numbers, reproduction, and distribution. We relate the fourth parameter, diversity, to all three regulatory criteria. Numbers, reproduction, and distribution are all affected when genetic or life history variability is lost or constrained. This results in reduced population resilience to environmental variation at local or landscape-level scales.

2.2.1.1. CCC Steelhead General Life History

Steelhead are anadromous forms of *O. mykiss*, spending some time in both fresh- and saltwater. The older juvenile and adult life stages reside in the ocean, until the adults ascend freshwater streams to spawn. Unlike Pacific salmon, steelhead are iteroparous, or capable of spawning more than once before death (Busby *et al.* 1996). Although one-time spawners are the great majority, Shapovalov and Taft (1954) reported that repeat spawners are relatively numerous (17.2 percent) in California streams. Eggs (laid in gravel nests called redds), alevins (gravel dwelling hatchlings), fry (juveniles newly emerged from stream gravels), and young juveniles all rear in freshwater until they become large enough to migrate to the ocean to finish rearing and maturing to adults.

General reviews for steelhead in California document much variation in life history (Barnhart 1986; Busby *et al.* 1996; Shapovalov and Taft 1954). Although variation occurs, in coastal California steelhead usually live in freshwater for 1 to 2 years before emigrating to the ocean. Juvenile steelhead emigration from San Francisco Bay natal streams occurs episodically during winter and spring months, and generally occurs during high flow events. Barnhart (1986) reports that peak smolt migration occurs in March and April, and steelhead smolts in California typically range in size from 140 to 210 millimeter (mm) (fork length). Steelhead of this size can withstand higher salinities than smaller fish, and are more likely to occur for longer periods in tidally influenced estuaries, such as San Francisco Bay. Steelhead smolts in most river systems must pass through estuaries prior to seawater entry. Once they leave their natal streams, steelhead will spend 1 to 3 years in the ocean before returning to spawn.

Based on the timing of adult migration from the ocean to freshwater, CCC steelhead are classified as winter-run steelhead. Adult CCC steelhead typically enter freshwater between December and April, peaking in January and February (Fukushima and Lesh 1998). Steelhead females build redds to bury eggs for a several month-long incubation period. Redds are generally located in areas where the hydraulic conditions are such that fine sediments, for the most part, are sorted out and streamflow is constant. This is because, during the incubation period, the intragravel environment must permit a constant flow of water to deliver dissolved oxygen and to remove metabolic wastes. Other intragravel parameters such as the gravel permeability, water temperature, substrate composition, and organic material in the substrate effect the survival of eggs to fry emergence (Chapman 1988; Everest *et al.* 1987; Shapovalov and Taft 1954). Adult steelhead may spawn 1 to 4 times over their life span.

Steelhead fry rear in freshwater edgewater habitats and move gradually into pools and riffles as they grow larger. Cover, water temperature, sediment, and food items are important habitat components for juvenile steelhead. Cover in the form of woody debris, rocks, overhanging banks, and other in-water structures provide velocity refuge and a means of avoiding predation (Bjornn *et al.* 1991; Shirvell 1990). Steelhead, however, tend to use riffles and other habitats not strongly associated with cover during summer rearing more than other salmonids. In winter, juvenile steelhead become less active and hide in available cover, including gravel or woody debris. Young steelhead feed on a wide variety of aquatic and terrestrial insects, and emerging fry are sometimes preyed upon by older juveniles. Water temperature can influence the metabolic rate, distribution, abundance, and swimming ability of rearing juvenile steelhead (Barnhart 1986; Bjornn and Reiser 1991b; Myrick and Cech 2005). Optimal temperatures for steelhead growth range between 10 and 20 degrees (°) Celsius (C) (Hokanson *et al.* 1977; Myrick and Cech 2005; Wurtsbaugh and Davis 1977). Fluctuating diurnal water temperatures are also important for the survival and growth of salmonids (Busby *et al.* 1996).

Turbidity (*i.e.*, water clarity) also can influence the behavior, distribution, and growth of steelhead (Cordone and Kelley 1961; Newcombe and Jensen 1996; Newcombe and MacDonald 1991; Redding *et al.* 1987; Sigler *et al.* 1984). The impacts of turbidity on juvenile salmonids are largely linked to factors such as background turbidity levels and the duration of turbid conditions. Bisson and Bilby (1982) found that juvenile coho salmon that were acclimated to clear water did not exhibit significant sediment avoidance until the turbidity reached 70 NTUs. Sigler *et al.* (1984) observed avoidance of turbid water by juvenile steelhead and coho when exposed to turbidities as low as 38 NTUs and 22 NTUs, respectively, for a period of 15-17 days. Sigler *et al.* (1984) also observed that fish kept in these turbid conditions had lower growth rates than fish kept in clear water for the same amount of time.

2.2.1.2. Status of CCC Steelhead DPS and Critical Habitat

Historically, approximately 70 populations[2] of steelhead existed in the CCC steelhead DPS (Spence *et al.* 2008; Spence *et al.* 2012). Many of these populations (about 37) were independent, or potentially independent, meaning they had a high likelihood of surviving for 100 years absent anthropogenic impacts (Bjorkstedt *et al.* 2005). The remaining populations were

[2] Population as defined by Bjorkstedt *et al.* 2005 and McElhaney *et al.* 2000 as, in brief summary, a group of fish of the same species that spawns in a particular locality at a particular season and does not interbreed substantially with fish from any other group. Such fish groups may include more than one stream. These authors use this definition as a starting point from which they define four types of populations (not all of which are mentioned here).

dependent upon immigration from nearby CCC steelhead DPS populations to ensure their viability (Bjorkstedt *et al.* 2005; McElhany *et al.* 2000).

While historical and present data on abundance are limited, CCC steelhead numbers are substantially reduced from historical levels. A total of 94,000 adult steelhead were estimated to spawn in the rivers of this DPS in the mid-1960s, including 50,000 fish in the Russian River - the largest population within the DPS (Busby *et al.* 1996). Near the end of the 20th century the population of wild CCC steelhead in the Russian River was estimated to be between 1,700-7,000 fish (Busby *et al.* 1996; Good *et al.* 2005) . Recent estimates for the Russian River population are unavailable since monitoring data is limited. Abundance estimates for smaller coastal streams in the DPS indicate low population levels that are slowly declining, with recent estimates (2011/2012) for several streams (Redwood [Marin County], Waddell, San Vicente, Soquel, and Aptos creeks) of individual run sizes of 50 fish or less (Nature Conservancy 2013). Some loss of genetic diversity has been documented and attributed to previous among-basin transfers of stock and local hatchery production in interior populations in the Russian River (Bjorkstedt *et al.* 2005). Similar losses in genetic diversity in the Napa River may have resulted from out-of-basin and out-of-DPS releases of steelhead in the Napa River basin in the 1970s and 80s. These transfers included fish from the South Fork Eel River, San Lorenzo River, Mad River, Russian River, and the Sacramento River. In San Francisco Bay streams, reduced population sizes and fragmentation of habitat has likely also led to loss of genetic diversity in these populations. For more detailed information on trends in CCC steelhead abundance, see: (Busby *et al.* 1996; Good *et al.* 2005; Spence *et al.* 2008; Williams *et al.* 2011).

CCC steelhead have experienced serious declines in abundance and long-term population trends suggest a negative growth rate. This indicates the DPS may not be viable in the long term. DPS populations that historically provided enough steelhead immigrants to support dependent populations may no longer be able to do so, placing dependent populations at increased risk of extirpation. However, because CCC steelhead remain present in most streams throughout the DPS, roughly approximating the known historical range, CCC steelhead likely possess a resilience that is likely to slow their decline relative to other salmonid DPSs or ESUs in worse condition. In 2005, a status review concluded that steelhead in the CCC steelhead DPS remain "likely to become endangered in the foreseeable future" (Good *et al.* 2005). On January 5, 2006, NMFS issued a final determination that the CCC steelhead DPS is a threatened species, as previously listed (71 FR 834).

A more recent viability assessment of CCC steelhead concluded that populations in watersheds that drain to San Francisco Bay are highly unlikely to be viable, and that the limited information available did not indicate that any other CCC steelhead populations could be demonstrated to be viable[3] (Spence *et al.* 2008). Monitoring data from the last ten years of adult CCC steelhead returns in Lagunitas and Scott creeks show steep declines in adults in 2008/2009. In 2011/2012 population levels began to increase, but still remained lower than levels observed over the past ten years (Nature Conservancy 2013). The most recent status update found that the status of the CCC steelhead DPS remains "likely to become endangered in the foreseeable future" (Williams *et al.* 2011), as new and additional information available since Good *et al.* (2005), does not

[3] Viable populations have a high probability of long-term persistence (> 100 years).

appear to suggest a change in extinction risk. On December 7, 2011, NMFS chose to maintain the threatened status of the CCC steelhead (76 FR 76386).

Critical habitat was designated for CCC steelhead on September 2, 2005 (70 FR 52488) and includes PCEs essential for the conservation of CCC steelhead. These PCEs include estuarine areas free of obstruction and excessive predation with the following essential features: (1) water quality, water quantity and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; (2) natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and (3) juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation (70 FR 52488).

The condition of CCC steelhead critical habitat, specifically its ability to provide for their conservation, has been degraded from conditions known to support viable salmonid populations. NMFS has determined that present depressed population conditions are, in part, the result of the following human-induced factors affecting critical habitat[4]: logging, agricultural and mining activities, urbanization, stream channelization, dams, wetland loss, and water withdrawals, including unscreened diversions for irrigation. Impacts of concern include alteration of streambank and channel morphology, alteration of water temperatures, loss of spawning and rearing habitat, fragmentation of habitat, loss of downstream recruitment of spawning gravels and large woody debris, degradation of water quality, removal of riparian vegetation resulting in increased streambank erosion, loss of shade (higher water temperatures) and loss of nutrient inputs (70 FR 52488 ; Busby *et al.* 1996). Water development has drastically altered natural hydrologic cycles in many of the streams in the DPS. Alteration of flows results in migration delays, loss of suitable habitat due to dewatering and blockage; stranding of fish from rapid flow fluctuations; entrainment of juveniles into poorly screened or unscreened diversions, and increased water temperatures harmful to salmonids. Overall, current condition of CCC steelhead critical habitat is degraded, and does not provide the full extent of conservation value necessary for the recovery of the species.

2.2.2. Species Description, Life History, and Status- Southern DPS Green Sturgeon

2.2.2.1. Green Sturgeon General Life History

Green sturgeon is an anadromous, long-lived, and bottom-oriented fish species in the family Acipenseridae. Sturgeon have skeletons composed mostly of cartilage and lack scales, instead possessing five rows of characteristic bony plates on their body called "scutes." On the underside of their flattened snouts are sensory barbels and a siphon-shaped, protrusible, toothless mouth. Large adults may exceed 2 meters in length and 100 kilograms in weight (Moyle 1976). Based on genetic analyses and spawning site fidelity, NMFS determined that North American green sturgeon are comprised of at least two DPSs: a northern DPS consisting of populations originating from coastal watersheds northward of and including the Eel River (“northern DPS

[4] Other factors, such as over fishing and artificial propagation have also contributed to the current population status of steelhead. All these human induced factors have exacerbated the adverse effects of natural factors such as drought and poor ocean conditions.

green sturgeon"), with spawning confirmed in the Klamath and Rogue river systems; and a southern DPS consisting of populations originating from coastal watersheds south of the Eel River ("southern DPS green sturgeon"), with spawning confirmed in the Sacramento River system (Adams *et al.* 2002).

Green sturgeon is the most marine-oriented species of sturgeon (Moyle 2002). Along the West Coast of North America, they range in nearshore waters from Mexico to the Bering Sea (Adams *et al.* 2002), with a general tendency to head north after their out-migration from freshwater ((Lindley *et al.* 2011). While in the ocean, archival tagging indicates that green sturgeon occur in waters between 0 and 200 meters depth, but spend most of their time in waters between 20–80 meters and temperatures of 9.5–16.0°C (Huff *et al.* 2011; Nelson *et al.* 2010). Subadult and adult green sturgeon move between coastal waters and estuaries (Lindley *et al.* 2011; Lindley *et al.* 2008), but relatively little is known about how green sturgeon use these habitats. Lindley *et al.* (2011) reported multiple rivers and estuaries are visited by aggregations of green sturgeon in summer months, and larger estuaries (*e.g.*, San Francisco Bay) appear to be particularly important habitat. During the winter months, green sturgeon generally reside in the coastal ocean. Areas north of Vancouver Island are favored overwintering areas, with Queen Charlotte Sound and Hecate Strait likely destinations based on detections of acoustically-tagged green sturgeon (Lindley *et al.* 2008; Nelson *et al.* 2010).

Based on genetic analysis, (Israel *et al.* 2009) reported that almost all green sturgeon collected in the San Francisco Bay system were southern DPS. This is corroborated by tagging and tracking studies which found that no green sturgeon tagged in the Klamath or Rogue rivers (*i.e.*, Northern DPS) have yet been detected in San Francisco Bay (Lindley *et al.* 2011). However, green sturgeon inhabiting coastal waters adjacent to San Francisco Bay include northern DPS green sturgeon.

Adult southern DPS green sturgeon spawn in the Sacramento River watershed during the spring and early summer months (Moyle *et al.* 1995). Eggs are laid in turbulent areas on the river bottom and settle into the interstitial spaces between cobble and gravel (Adams *et al.* 2007). Like salmonids, green sturgeon require cool water temperatures for egg and larval development, with an upper thermal limit for developing embryos of 17˚C (Van Eenennaam *et al.* 2005). Eggs hatch after 6–8 days, and larval feeding begins 10–15 days post-hatch. Larvae grow into juveniles typically after a minimum of 45 days (post-hatch) when fish have reached 60–80 mm total length (TL) and have migrated downstream. Juveniles spend their first few years in the Delta and San Francisco estuary before entering the marine environment as subadults. Juvenile green sturgeon salvaged at the State and Federal water export facilities in the southern Delta are generally between 200 mm and 400 mm TL (Adams *et al.* 2002), which suggests southern DPS green sturgeon spend several months to a year rearing in freshwater before entering the Delta and San Francisco estuary. Laboratory studies conducted by Allen and Cech (2007) indicated juveniles approximately 6 month old were tolerant of saltwater, but approximately 1.5-year old green sturgeon appeared more capable of successful osmoregulation in salt water.

Subadult green sturgeon spend several years at sea before reaching reproductive maturity and returning to freshwater to spawn for the first time (Nakamoto *et al.* 1995). Little data are available regarding the size and age-at-maturity for the southern DPS green sturgeon, but it is likely similar to that of the northern DPS. Male and female green sturgeon differ in age-at-maturity. Males can mature as young as 14 years and female green sturgeon mature as early as age 16 (Van Eenennaam *et al.* 2006). Adult green sturgeon are believed to spawn every two to five years. Recent telemetry studies by Heublein *et al.* (2009) indicate adults typically enter San Francisco Bay from the ocean and begin their upstream spawning migration between late February and early May. These adults on their way to spawning areas in the upper Sacramento River typically migrate rapidly through the estuary toward their upstream spawning sites. Preliminary results from tagged adult sturgeon suggest travel time from the Golden Gate to Rio Vista in the Delta is generally 1-2 weeks. Post-spawning, tagged southern DPS green sturgeon displayed two outmigration strategies (Heublein *et al.* 2009); outmigration from Sacramento River prior to September 1 and outmigration during the onset of fall/winter stream flow increases. The transit time for post-spawning adults through the San Francisco estuary appears to be very similar to their upstream migration (*i.e.*, 1-2 weeks).

During the summer and fall, an unknown proportion of the population of non-spawning adults and subadults enter the San Francisco estuary from the ocean for periods ranging from a few days to 6 months (Lindley *et al.* 2011). Some fish are detected only near the Golden Gate, while others move as far inland as Rio Vista in the Delta. The remainder of the population appear to enter bays and estuaries farther north from Humboldt Bay, California to Grays Harbor, Washington (Lindley *et al.* 2011).

Green sturgeon feed on benthic invertebrates and fish (Adams *et al.* 2002). Radtke (1966) analyzed stomach contents of juvenile green sturgeon captured in the Sacramento-San Joaquin Delta and found the majority of their diet was benthic invertebrates, such as mysid shrimp and amphipods (Corophium spp). Dumbauld *et al. (2008)* report that immature green sturgeon found in Willapa Bay, Grays Harbor, and the Columbia River Estuary, fed on a diet consisting primarily of benthic prey and fish common to these estuaries (ghost shrimp, crab, and crangonid shrimp), with burrowing thalassinid shrimp representing a significant proportion of the sturgeon diet. Dumbauld *et al.* (2008) observed feeding pits (depressions in the substrate believed to be formed when green sturgeon feed) in soft-bottom intertidal areas where green sturgeon are believed to spend a substantial amount foraging.

2.2.2.2. Status of Southern DPS Green Sturgeon and Critical Habitat

To date, little population-level data have been collected for green sturgeon. In particular, there are no published abundance estimates for either northern DPS or southern DPS green sturgeon in any of the natal rivers based on survey data. As a result, efforts to estimate green sturgeon population size have had to rely on sub-optimal data with known potential biases. Available abundance information comes mainly from four sources: 1) incidental captures in the CDFW white sturgeon (*Acipenser transmontanus*) monitoring program; 2) fish monitoring efforts associated with two diversion facilities on the upper Sacramento River; 3) fish salvage operations at the water export facilities on the Sacramento-San Joaquin Delta; and 4) dual frequency sonar identification in spawning areas of the upper Sacramento River. These data are insufficient in a variety of ways (short time series, non-target species, etc.) and do not support more than a qualitative evaluation of changes in green sturgeon abundance.

CDFW's white sturgeon monitoring program incidentally captures southern DPS green sturgeon. Trammel nets are used to capture white sturgeon and CDFW utilizes a multiple-census or Peterson mark-recapture method to estimate the size of subadult and adult sturgeon population (https://www.dfg.ca.gov/fish/Resources/Sturgeon/). By comparing ratios of white sturgeon to green sturgeon captures, estimates of southern DPS green sturgeon abundance can be calculated. Estimated abundance of green sturgeon between 1954 and 2001 ranged from 175 fish to more than 8,000 per year and averaged 1,509 fish per year. Unfortunately, there are many biases and errors associated with these data, and CDFW does not consider these estimates reliable. For larval and juvenile green sturgeon in the upper Sacramento River, information is available from salmon monitoring efforts at the Red Bluff Diversion Dam (RBDD) and the Glenn-Colusa Irrigation District (GCID). Incidental capture of larval and juvenile green sturgeon at the RBDD and GCID have ranged between 0 and 2,068 green sturgeon per year (Adams *et al.* 2002). Genetic data collected from these larval green sturgeon suggest that the number of adult green sturgeon spawning in the upper Sacramento River remained roughly constant between 2002 and 2006 in river reaches above Red Bluff (Israel and May 2010). In 2011, rotary screw traps operating in the Upper Sacramento River at RBDD captured 3,700 larval green sturgeon which represents the highest catch on record in 16 years of sampling (Poytress *et al.* 2011).

Juvenile green sturgeon are collected at water export facilities operated by the California Department of Water Resources (DWR) and the Federal Bureau of Reclamation (BOR) in the Sacramento-San Joaquin Delta. Fish collection records have been maintained by DWR from 1968 to present and by BOR from 1980 to present. The average number of southern DPS green sturgeon taken per year at the DWR facility prior to 1986 was 732; from 1986 to 2001, the average per year was 47 (70 FR 17386). For the BOR facility, the average number prior to 1986 was 889; from 1986 to 2001 the average was 32 (70 FR 17386). Direct capture in the salvage operations at these facilities is a small component of the overall effect of water export facilities on southern DPS green sturgeon; entrained juvenile green sturgeon are exposed to potential high levels of predation by non-native predators, disruption in migratory behavior, and poor habitat quality. Delta water exports have increased substantially since the 1970s and it is likely that this has contributed to negative trends in the abundance of migratory fish that utilize the Delta, including the southern DPS green sturgeon.

During the spring and summer spawning period, researchers with University of California Davis have utilized dual-frequency identification sonar (*i.e.*, DIDSON) to enumerate adult green sturgeon in the upper Sacramento River. These surveys estimated 175 to 250 sturgeon (±50) in the mainstem Sacramento River during the 2010 and 2011 spawning seasons. However, it is important to note that this estimate may include some white sturgeon, and movements of individuals in and out of the survey area confound these estimates. Given these uncertainties, caution must be taken in using these estimates to infer the spawning run size for the Sacramento River, until further analyses are completed.

The southern DPS green sturgeon was listed as threatened on April 7, 2006 (71 FR 17757). NMFS determined that the southern DPS green sturgeon was likely to become endangered in the foreseeable future due to the substantial loss of spawning habitat, the concentration of a single spawning population in one section of the Sacramento River, and multiple other risks to the species such as stream flow management, degraded water quality, and introduced species (NMFS

2005). A recent status review update concluded that there has been no significant change in the status of Southern DPS green sturgeon since they were listed as Threatened in 2006 (NMFS 2015). This was based on an evaluation of new information generated since the 2006 which indicated that some threats, such as those posed by fisheries and impassable barriers, have been reduced. It also identified an emerging threat posed by nearshore and offshore energy development that requires continued attention into the future. Overall, the new information did not provide conclusive data indicating that habitat conditions and factors have changed in severity or degree of threat since 2006, and that additional research is needed. Since many of the threats cited in the original listing still exist, on August 11, 2015, NMFS chose to maintain the threatened status of the southern DPS green sturgeon (NMFS 2015).

Critical habitat was designated for the southern DPS of green sturgeon on October 9, 2009 (74 FR 52300). Critical habitat includes coastal marine waters within 60 fathoms depth from Monterey Bay, California to Cape Flattery, Washington, and includes the Strait of Juan de Fuca to its United States boundary. Designated critical habitat also includes the Sacramento River, lower Feather River, lower Yuba River, Sacramento-San Joaquin Delta, Suisun Bay, San Pablo Bay, and San Francisco Bay in California. PCEs of designated critical habitat in estuarine areas are food resources, water flow, water quality, mitigation corridor, depth, and sediment quality. In freshwater riverine systems, PCEs of green sturgeon critical habitat are food resources, substrate type or size, water flow, water quality, migratory corridor, depth, and sediment quality. In nearshore coastal marine areas, PCEs are migratory corridor, water quality, and food resources.

The current condition of critical habitat for the southern DPS of green sturgeon is degraded over its historical conditions. It does not provide the full extent of conservation values necessary for the recovery of the species, particularly in the upstream riverine habitat of the Sacramento River. In the Sacramento River, migration corridor and water flow PCEs have been impacted by human actions, substantially altering the historical river characteristics in which the southern DPS of green sturgeon evolved. In addition, the Delta may have a particularly strong impact on the survival and recruitment of juvenile green sturgeon due to their protracted rearing time in brackish and estuarine waters.

2.2.3. Factors Responsible for Steelhead and Sturgeon Stock Declines

NMFS cites many reasons (primarily anthropogenic) for the decline of steelhead (Busby *et al.* 1996) and southern DPS of green sturgeon (Adams *et al.* 2002; National Marine Fisheries Service (NMFS) 2005). The foremost reason for the decline in these anadromous populations is the degradation and/or destruction of freshwater and estuarine habitat. Additional factors contributing to the decline of these populations include: commercial and recreational harvest, artificial propagation, natural stochastic events, marine mammal predation, and reduced marine-derived nutrient transport.

The following section details the general factors affecting the CCC steelhead and southern green sturgeon in California. The extent to which there are species specific differences in these factors is not clear; however, the freshwater and estuarine ecosystem characteristics necessary for the maintenance of self-sustaining populations of steelhead and green sturgeon are similar. Therefore, most of these factors below affect both steelhead and green sturgeon.

2.2.3.1. Habitat Degradation and Destruction

The best scientific information presently available demonstrates a multitude of factors, past and present, have contributed to the decline of west coast salmonids by reducing and degrading habitat by adversely affecting essential habitat features. Most of this habitat loss and degradation has resulted from anthropogenic watershed disturbances caused by urban development, agriculture, poor water quality, water resource development, dams, gravel mining, forestry (Adams *et al.* 2002; Busby *et al.* 1996; Good *et al.* 2005), and lagoon management (Bond 2006; Smith 1990).

The final rule listing Southern DPS green sturgeon indicates that the principle factor for the decline in the DPS is the reduction of spawning to a limited area in the Sacramento River (71 FR 17757). The constriction of spawning areas is caused by passage impediments associated with several dams, weirs, and diversions on the Sacramento River and its tributaries. While some of these passage impediments have been improved (*e.g.*, RBDD), significant numbers of these structures continue to impede passage of green sturgeon to spawning areas.

2.2.3.2. Commercial and Recreational Harvest

Ocean salmon fisheries off California are managed to meet the conservation objectives for certain stocks of salmon listed in the Pacific Coast Salmon FMP, including any stock that is listed as threatened or endangered under the ESA. Early records did not contain quantitative data by species until the early 1950's. In addition, the confounding effects of habitat deterioration, drought, and poor ocean conditions on salmonids make it difficult to assess the degree to which recreational and commercial harvest have contributed to the overall decline of salmonids and green sturgeon in West Coast rivers.

Since being listed in 2006, landing and sales of green sturgeon is prohibited. A recent analysis of green sturgeon bycatch (Lee et al. 2015) estimated the number of Southern DPS green sturgeon bycatch in federally managed fisheries (*e.g*., LE groundfish bottom trawl, IFQ groundfish bottom trawl, and at-sea hake fisheries) was 20.9 in 2011, 12.1 in 2012, and 5.5 in 2013, below NMFS's authorized take level of 28 per year (NMFS 2012).

2.2.3.3. Artificial Propagation

Releasing large numbers of hatchery fish can pose a threat to wild steelhead stocks through genetic impacts, competition for food and other resources, predation of hatchery fish on wild fish, and increased fishing pressure on wild stocks as a result of hatchery production (Waples 1991).

2.2.3.4. Natural Stochastic Events

Natural events such as droughts, landslides, floods, and other catastrophes have adversely affected steelhead and green sturgeon populations throughout their evolutionary histories. The effects of these events are exacerbated by anthropogenic changes to watersheds such as logging, roads, and water diversions. These anthropogenic changes have limited the ability of steelhead and green sturgeon to rebound from natural stochastic events and further depressed populations to critically low levels.

2.2.3.5. Marine Mammal Predation

The population of some marine mammal species, such as the Harbor seal (*Phoca vitulina*) and California sea lion (*Zalophus californianus*), have increased along the Pacific Coast (NMFS 1999). Although predation by these mammals is not believed to be a major factor in overall population decline, there may be substantial localized impacts on steelhead particularly during the migration season (Hanson 1993). CDFW notes predation on Southern DPS green sturgeon by California sea lions in the Sacramento River, bays, and Delta[5]. Steller and California sea lion abundance has increased in recent decades (NMFS 2013).

2.2.3.6. Invasive Species

San Francisco Bay is considered one of the most invaded estuaries in the world (Cohen and Carlton 1998). Invasive species contribute up to 99 percent of the biomass of some of the communities in the Bay (Cloern and Jassby 2012). Invasive species can disrupt ecosystems that support native populations. While there have been numerous invasions in the Bay, the best documented and studied invasive is the nonnative overbite clam (*Corbula amurensis*). It is a small clam native to rivers and estuaries of East Asia that is believed to be introduced in the ballast waters of ships entering the Bay in the late 1980s. The overbite clam can utilize a broad suite of food resources and withstand a wide range of salinities, including a tolerance of salinities less than 1 part per thousand (Nichols *et al.* 1990). Its introduction has corresponded with a decline in phytoplankton and zooplankton abundance due to grazing by the overbite clam (Kimmerer *et al.* 1994). Prior to its introduction, phytoplankton biomass in the Bay was approximately three times what it is today (Cloern 1996; Cloern and Jassby 2012), and the zooplankton community has changed from one having large abundances of mysid shrimp, rotifers, and calanoid copepods to one dominated by copepods indigenous to East Asia (Winder and Jassby 2011).

Kogut (2008) noted that overbite clams passed through the gut of white sturgeon alive. NMFS assumes that this may occur with green sturgeon too. Clams passing alive through a sturgeon's gut may lead to adverse effects on calorie and nutrient intake of sturgeon and may be a mechanism to assist in distribution of overbite clams to novel areas.

[5] California Department of Fish and Wildlife submitted comments in response to NMFS' invitation to review the green sturgeon Southern DPS draft status review in 2013.

2.2.3.7. Reduced Marine-Derived Nutrient Transport

Marine-derived nutrients from adult salmon carcasses have been shown to be vital for the growth of juvenile salmonids and the surrounding terrestrial and riverine ecosystems (Bilby *et al.* 1996; Bilby *et al.* 1998; Gresh *et al.* 2000). Declining salmon and steelhead populations have resulted in decreased marine-derived nutrient transport to many watersheds. This has contributed to the further decline of ESA-listed salmonid populations (Gresh *et al.* 2000).

2.2.3.8. Ocean Conditions

Recent evidence suggests poor ocean conditions played a significant role in the low number of returning adult fall run Chinook salmon to the Sacramento River in 2007 and 2008 (Lindley *et al.* 2009). The decline in ocean conditions likely affected ocean survival of all west coast salmonid populations (Good *et al.* 2005; Spence *et al.* 2008). Changing ocean conditions could also impact Southern DPS green sturgeon since subadults and adults use ocean habitats for migration and potentially for feeding. Based on their use of coastal bay and estuarine habitats, subadults and adults can occupy habitats with a wide range of temperature, salinity, and dissolved oxygen levels, so predicting the impact of climate change in these environments is difficult (Kelly *et al.* 2007; Lindley *et al.* 2008).

2.2.3.9. Global Climate Change

One factor affecting the rangewide status of CCC steelhead and Southern DPS green sturgeon, and aquatic habitat at large is climate change. The acceptance of global climate change as a scientifically valid and human caused phenomenon has been well established by the United Nations Framework Convention on Climate Change (UNFCCC), the Intergovernmental Panel on Climate Change, and others (Davies *et al.* 2001; Oreskes 2004; UNFCCC 2014). The most relevant trend in climate change is the warming of the atmosphere from increased greenhouse gas emissions. This warming is inseparably linked to the oceans, the biosphere, and the world's water cycle. Changes in the distribution and abundance of a wide array of biota confirm a warming trend is in progress, and that it has great potential to affect species' survival (Davies *et al.* 2001). In general, as the magnitude of climate fluctuations increases, the population extinction rate also increases (Good *et al.* 2005). Global warming is likely to manifest itself differently in different regions.

Modeling of climate change impacts in California suggests average summer air temperatures are expected to increase (Lindley *et al.* 2007). Heat waves are expected to occur more often, and heat wave temperatures are likely to be higher (Hayhoe *et al.* 2004). Total precipitation in California may decline; critically dry years may increase (Lindley *et al.* 2007; Schneider 2007). The Sierra Nevada snow pack is likely to decrease by as much as 70 to 90 percent by the end of this century under the highest emission scenarios modeled (Luers *et al.* 2006). Wildfires are expected to increase in frequency and magnitude, by as much as 55 percent under the medium emissions scenarios modeled (Luers *et al.* 2006). Vegetative cover may also change, with decreases in evergreen conifer forest and increases in grasslands and mixed evergreen forests. The likely change in amount of rainfall in Northern and Central Coastal streams under various warming scenarios is less certain, although as noted above, total rainfall across the state is expected to decline. For the California North Coast, some models show large increases (75 to 200 percent) while other models show decreases of 15 to 30 percent (Hayhoe *et al.* 2004). Many of these changes are likely to further degrade salmonid habitat by, for example, reducing stream flows during the summer and raising summer water temperatures. Estuaries may also experience changes detrimental to green sturgeon. Estuarine productivity is likely to change based on changes in freshwater flows, nutrient cycling, and sediment amounts (Scavia *et al.* 2002). The projections described above are for the mid to late 21st Century. In shorter time frames natural climate conditions are more likely to predominate (Cox and Stephenson 2007; Smith and Murphy 2007).

2.3 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR §402.02).

2.3.1. <u>Status of Critical Habitat in Action Area</u>

Designated critical habitat for CCC steelhead includes all aquatic habitat within the action area. Within the action area, essential features of critical habitat include estuarine areas. The critical habitat designation for CCC steelhead specifies that:

> *…estuarine areas should be free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation. These features are essential to conservation because without them juveniles cannot reach the ocean in a timely manner and use the variety of habitats that allow them to avoid predators, compete successfully, and complete the behavioral and physiological changes needed for life in the ocean. Similarly, these features are essential to the conservation of adults because they provide a final source of abundant forage that will provide the energy stores needed to make the physiological transition to fresh water, migrate upstream, avoid predators, and develop to maturity upon reaching spawning areas* (70 FR 52488).

These essential features of designated critical habitat for adult and juvenile steelhead within the action area are partially degraded and limited due to channelization, high water velocities, limited water depth and natural cover, lack of emergent marsh, and reduced channel complexity (*i.e.*, floodplains and side channels).

The project's action area is located within designated critical habitat for the southern DPS of green sturgeon. PCEs essential for green sturgeon critical habitat in estuarine areas include food resources, water flow, water quality, migratory corridor, water depth, and sediment quality. These PCEs for green sturgeon critical habitat in the action area are partially degraded. NMFS believes the overall PCE for rearing of green sturgeon is degraded due to the poor overall condition of the habitat, including a lack of emergent marsh, limited depth and cover, and reduced channel complexity. Adult southern DPS green sturgeon are only known to spawn in deep, turbulent pools in the upper Sacramento River below Keswick Dam and therefore spawning would not occur in the San Francisquito Creek watershed.

2.3.2. Status of Listed Species in the Action Area

2.3.2.1. CCC Steelhead

The San Francisquito Creek watershed CCC steelhead population represents one of only a few known remaining runs in tributary streams to South San Francisco Bay. The mainstem of San Francisquito Creek provides access between the headwaters of the watershed and San Francisco Bay and, thus, is essential for the immigration of steelhead adults and the emigration of smolts. Juvenile and adult abundance data for this watershed are very limited.

Based on the limited surveys that have been conducted, adult steelhead currently occur in San Francisquito Creek and its tributaries (Launer and Spain 1998; Leidy *et al.* 2005). Most steelhead presence data are based on observations from local residents/biologists and pertain primarily to the upper watershed. Launer and Spain (1998) conducted observations of fish and amphibian communities in San Francisquito Creek through the Stanford University (approximately 6 miles upstream of the action area) property during the summer of 1997. Based on their observations, they estimated a few thousand juvenile steelhead inhabited that segment of the creek, which represents a small fraction of the total available rearing habitat available to steelhead in the watershed. In the summer of 2004, juvenile steelhead were captured and relocated at two sites on the upper mainstem of San Francisquito Creek. Juvenile steelhead densities at the two sites were approximately 17 and 12 fish per 100 feet respectively (D.W. Alley and Associates 2004).

During the course of their downstream migration, juvenile steelhead may utilize the estuarine reaches of San Francisquito Creek and San Francisco Bay for seasonal rearing, but available information suggests that fish are actively migrating and currently they do not reside in estuarine reaches or the San Francisco Bay estuary (Chapman *et al.* 2015). Historically, the tidal marshes of San Francisco Bay provided a highly productive estuarine environment for juvenile anadromous salmonids. However, loss of habitat, changes in prey communities, and water-flow alterations and reductions have degraded habitat and likely limit the ability of the Bay and the action area to support juvenile rearing. MacFarlane and Norton (2002) found that fall-run Chinook experienced little growth, depleted condition, and no accumulation of lipid energy reserves during the relatively limited time the fish spent transiting the 40-mile length of the estuary. Sandstrom *et al.* (2013) found that CCC steelhead smolts emigrated more rapidly through the Bay than the Napa River and the ocean.

Steelhead use of the action area would be primarily as migratory habitat for adults and smolts migrating in and out of the watershed during the winter and spring months. As noted earlier, reaches upstream of the U.S. Highway 101 Bridges go dry in most years and therefore summer rearing habitat is not available at this location (Launer and Spain 1998; Leidy *et al.* 2005; Metzger 2002). In the action area, NMFS expects juvenile and smolt steelhead presence during construction activities is unlikely due to the lack of connection with upstream freshwater rearing areas in the summer months, the timing of project construction (*i.e.,* at the end of the smolt out-migration season), and the poor quality of rearing habitat described above.

2.3.2.2. Southern DPS Green Sturgeon:

Sub-adult and non-spawning adult green sturgeon are found in San Francisco Bay during the summer months; however, acoustic tagging studies suggest the duration of residence by an individual is typically 6 weeks . There are no known records of green sturgeon utilizing San Francisquito Creek. Green sturgeon have occasionally been captured by CDFW during trawl surveys in southern San Francisco Bay, and acoustic tagging studies have reported tagged green sturgeon in the vicinity of the Dumbarton Bridge, approximately 2.5 miles north of the Project (ECORP Consulting, Inc. unpublished data 2011).

While no surveys for green sturgeon have been conducted in the action area, tidal sloughs are used as foraging habitat by green sturgeon. Green sturgeon prey on demersal fish (*e.g.*, sand lance) and benthic invertebrates similar to those that green sturgeon are known to prey upon in estuaries of Washington and Oregon . Green sturgeon are known to be generalist feeders and may feed opportunistically on a variety of benthic species encountered. For example, the invasive overbite clam has become the most common food of white sturgeon, and for the green sturgeon that have been examined to date (CDFG 2002). Based on distribution data and foraging habits of green sturgeon, NMFS assumes they are present in the action area when tidal conditions permit. Based on the poor condition of habitat in the action area for green sturgeon (*i.e.,* shallow waters, poor cover, and limited foraging habitat) NMFS expects very few green sturgeon will be present in the action area during project construction.

2.3.2.3. Factors Affecting Species Environment within San Francisquito Creek and the Action Area

Factors affecting watershed reaches upstream of the action area have impacted steelhead, and to a significantly lesser degree affected green sturgeon. Jones and Stokes (2006) conducted a limiting factors analysis for steelhead in the San Francisquito Creek. Based on their conclusion, multiple factors are impacting the survival and abundance of steelhead in San Francisquito Creek. They identified poor overwintering habitat (*i.e.,* a lack of deep, complex pools) as the primary limiting factor for juvenile survival. Although the availability of summer rearing habitat was not found to be a limiting factor, they noted that summer rearing habitat was degraded due to a lack of deep pools, low abundance of large woody debris, limited coarse substrate accumulations caused by channelization, urban development, and stream flow regulation. Steelhead outmigration success is limited by seasonal drying which may be further impacted by fish passage impediments in San Francisquito Creek. In dry to average years, low spring outmigration flows severely limits passage for out-migrating smolts. Multiple dams in the upper watershed have blocked approximately 33 percent of the historic steelhead spawning habitat in the San Francisquito Creek watershed (Spence *et al.* 2008).

The lower reaches of San Francisquito Creek are heavily channelized and bordered by levees and dikes. Some areas of stream bank are armored with concrete to prevent erosion. In the action area, San Francisquito Creek is tidally influenced. The action area consists of a flood control channel with two tight curves, two long straight sections, and one soft bend. The current channel is confined by earthen levees for most of its length except in a small 300 foot long reach in the middle of the channel where the levees have partially degraded. Channel widths from the top of the northern to southern levees ranges between 110 to 200 feet. The flood control channel has an irregular v-shaped low flow channel bordered by a gentle sloping marshplain. The Palo Alto Municipal Golf Course is located on the south side of the creek within a portion of the action area.

Historically, this reach consisted of a sinuous main channel that transitioned into a distributary tidal marshland approximately 0.5 miles from the mouth of the creek (Hermstad 2009). Historical conditions supported a highly complex habitat structure with multiple entry/exit points, depth variability, more abundant woody debris in the channel, and a more expansive floodplain. All of which contributed to higher water levels at low tide, increased depth variability, and reduced stream velocities through the multichannel marsh. Major re-routing of the lower reaches took place in the late 1920s, with levees constructed on both sides of the creek for flood control and development purposes (Hermstad 2009). Constriction of the marsh within a narrow corridor has led to the current condition of a simplified channel and homogenous marshplain, with no side channels, deep pools, or large woody debris to provide natural cover for fish. Freshwater flow through the action area during the dry season is either non-existent or consists largely of urban runoff.

2.3.3. Previous Section 7 Consultations and Section 10 Permits in the Action Area

Within the past ten years, pursuant to section 7 of the ESA, NMFS conducted section 7 consultations in the action area:

2.3.3.1. Hwy 101Bridge Replacement Project

NMFS and the Caltrans completed formal section 7 consultation on Caltrans' proposal to replace the U.S. Highway 101 Bridge over San Francisquito Creek, and a biological opinion was issued on May 29, 2011. The biological opinion analyzed the effects of construction and operation of the bridge on CCC steelhead and southern DPS green sturgeon and their critical habitat. The biological opinion concluded that the project was not likely to jeopardize steelhead or green sturgeon, or adversely modify their critical habitat.

2.3.3.2. SCVWD Stream Maintenance Permit

NMFS and the Corps completed formal section 7 consultation on SCVWD's activities to be conducted between 2014 and 2023 in Santa Clara County as part of the SCVWD's SMP. A biological opinion was issued on April 29, 2014. The biological opinion analyzed the effects of maintenance activities on CCC steelhead, South-Central California Coast (S-CCC) steelhead, southern DPS green sturgeon, and their critical habitat. The biological opinion concluded that the project was not likely to jeopardize CCC steelhead, S-CCC steelhead, or southern DPS green sturgeon, or adversely modify their critical habitat.

2.3.3.3. Stanford University's proposed Steelhead Habitat Enhancement Program (SHEP) (NMFS PCTS #SWR-2006-00892 and WCR 2014- 875; and Corps File No. 28630S)

NMFS and the Corps completed formal section 7 consultation regarding Stanford University's proposed SHEP, and a biological opinion was issued on April 21, 2008. The formal consultation evaluated modifications to Stanford's San Francisquito Pump Station and the Los Trancos Diversion. The consultation and resulting biological opinion also evaluated the future operation of the San Francisquito Pump Station and Los Trancos Diversion under the SHEP's minimum bypass flow requirements. The biological opinion concluded the project was not likely to jeopardize the continued existence of threatened CCC steelhead or adversely modify CCC steelhead designated critical habitat.

The Corps requested reinitiation of formal consultation with NMFS in June 2014, to address a bank stabilization structure that failed at the Los Trancos Diversion facility and unsuccessful riparian mitigation plantings that needed to be replanted. The formal consultation analyzed the effects of these actions on CCC steelhead and their critical habitat, and a biological opinion was issued on August 27, 2014. The biological opinion concluded the project was not likely to jeopardize the continued existence of threatened CCC steelhead or adversely modify CCC steelhead designated critical habitat.

2.3.3.4. Stanford University's Habitat Conservation Plan (HCP)

In addition to the above interagency consultation, NMFS conducted an internal section 7 consultation on the proposed issuance of an ESA section 10(a)(1)(B) Incidental Take Permit (ITP) for Stanford's 2011 HCP. NMFS completed a biological opinion on October 19, 2012, which concluded the issuance of a 50-year ITP was not likely to jeopardize the continued existence of threatened CCC steelhead or adversely modify CCC steelhead designated critical habitat. However, NMFS did not proceed with the issuance of the ITP because Stanford requested by letter dated December 6, 2012, that NMFS suspend the processing of their application until such time as the Searsville Alternative Study is complete or advanced to a point where Stanford better understands the best future for Searsville Dam and Reservoir.

2.3.3.5. Research and Enhancement Permits

Research and enhancement projects resulting from NMFS' Section 10(a)(1)(A) research and enhancement permits and section 4(d) limits or exceptions could potentially occur in the action area. Salmonid and sturgeon monitoring approved under these programs includes juvenile and adult net surveys and tagging studies. In general, these activities are closely monitored and require measures to minimize take during the research activities. As of November 2015, no research or enhancement activities requiring Section 10(a)(1)(A) research and enhancement permits or section 4(d) limits have occurred in the action area.

2.4 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

In this biological opinion, our approach to determine the effects of the action was based on institutional knowledge and a review of the ecological literature and other relevant materials. We used this information to gauge the likely effects of the proposed project via an exposure and response framework that focuses on the stressors (physical, chemical, or biotic), directly or indirectly caused by the proposed action, to which CCC steelhead and southern DPS green sturgeon are likely to be exposed. Next, we evaluate the likely response of the above listed fish to these stressors in terms of changes to survival, growth, and reproduction, and changes to the ability of PCEs or physical and biological features to support the value of critical habitat in the action area. PCEs, and physical and biological features, include sites essential to support one or more life stages of the species. These sites for migration, spawning, and rearing in turn contain physical and biological features that are essential to the conservation of the species. Where data to quantitatively determine the effects of the proposed action on listed fish and their critical habitat were limited or not available, our assessment of effects focused mostly on qualitative identification of likely stressors and responses.

2.4.1. Effects on Species

2.4.1.1. Steelhead and Green Sturgeon Passage and Rearing Conditions

NMFS fish passage facility design criteria (NMFS 2011) re intended to assist with improving conditions for salmonids that must migrate past man-made structures to complete their life cycle. The criteria were developed by integrating knowledge about fish behavior, physiology, and bio-mechanics with hydraulic, hydrology, and engineering specifications of typical fish passage designs. For a structure to meet NMFS's fish passage requirements it ultimately must provide for the safe, timely, and efficient upstream and downstream passage of anadromous salmonids at impediments created by artificial structures, natural barriers, or altered instream hydraulic conditions.

There are no specific criteria for flood control channels, per se, but design criteria for similar structures (*i.e.,* fishways) can be adapted to flood control channels. NMFS assessed fish passage within the flood control channel using the hydraulic design criteria for culverts and other road crossings. 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. It is only suitable in streams with sufficiently low gradient. 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 hydrology 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 is required for this option.

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 is intended for the design of new, replacement culverts, and retrofitted culverts. NMFS chose to use this criterion as opposed to another method that heavily relies on geomorphic attributes (*i.e.*, the active channel method or stream simulation method) since the flood control channel exhibits a very simplified geometry and more closely resembles a very long natural bottom culvert than a natural, more complex channel.

The range of fish passage flows is frequently defined by exceedance flows obtained from a flow duration curve for the site. The San Francisquito Creek stream gage, operated by the USGS from 1950 to 2015 (65 years of record), is located near the Junipero Serra Boulevard Road crossing, roughly 6 to 7 miles upstream of the flood control channel. The historic daily average streamflow data from this gaging station was used to construct a flow duration curve for the project site representing flow conditions during the period of assumed adult steelhead migration (December through March).

Design high flow for fishways is the mean daily average streamflow that is exceeded 1 percent of the time on an annual basis, or the 5 percent exceedance flow if the flow duration is based on the period of fish migration. The fish passage design high flow is the highest streamflow for which migrants are expected to be present, migrating, and dependent on the channel or fishway for safe passage. Design low flow for fishways is the mean daily average streamflow that is exceeded 50 percent of the time on an annual basis. If the 50 percent exceedance flow is less than 3 cubic feet per second (cfs), then the low flow design should be for 3 cfs. The fish passage design low flow is the lowest streamflow for which migrants are expected to be present, migrating, and dependent on the channel or fishway for safe passage.

For San Francisquito Creek, the 5 percent exceedance during November through April is approximately 160 cfs which was selected as the high fish passage design flow for upstream steelhead passage. Since this is based on a more expansive timeframe than the peak steelhead migration window (December through March) in which the majority of high flows occur, 160 cfs is likely an underestimate of the 5 percent exceedance flow during the period of migration. For San Francisquito Creek the 95 percent exceedance flow during the period of migration is less than 1 cfs, so the alternative minimum flow of 3 cfs was selected as the low fish passage design flow for upstream steelhead passage.

A different set of criteria is commonly used by NMFS to assess juvenile salmonid passage. NMFS guidance recommends assessing high flow juvenile fish passage by calculating the average water velocity within a facility at the 10 percent annual exceedance flow (NMFS 2001) or the 50 percent exceedance flow for the time period corresponding to juvenile upstream passage (March through June) (NMFS 2011). The 50 percent exceedance flow in San Francisquito Creek during the period of juvenile passage is approximately 2.6 cfs which was selected as the high fish passage design flow for juvenile passage. NMFS guidance recommends the 95 percent annual exceedance flow or 1 cfs, whichever is greater, should be used for juveniles. The 95 percent exceedance flow during the migration period in San Francisquito Creek is less than 1 cfs, so the 95percent annual exceedance is less than that, and therefore the 1 cfs alternative was selected as the low design flow for juvenile passage.

During these design flows, NMFS fish passage guidance requires structures to maintain maximum average water velocities of less than or equal to 1 foot per second (ft/s) to enable juvenile steelhead to move throughout the structure; and between 2 and 6 ft/s to enable adult steelhead passage. The velocity threshold for adult passage is dependent upon the length of the structure in which the fish is migrating through (Table 2). Since the San Francisquito Flood Project reach is approximately 7700 linear feet, NMFS fish passage guidance prescribes a maximum allowable water velocity of 2 ft/s or less to enable adult steelhead passage.

Table 2. Maximum allowable average culvert velocity prescribed for fish passage structures using the hydraulic design criteria (NMFS 2001).

Culvert Length (ft)	Velocity (fps) - Adult Salmonids
<60	6
60-100	5
100-200	4
200-300	3
>300	2

NMFS fish passage guidance prescribed a minimum water depth at the fish passage design flows of 1.0 foot for adult steelhead and 0.5 feet for juvenile steelhead, as measured in the centerline of the channel. Table 3 summarizes NMFS fish passage criteria relevant to the project.

Table 3. Fish passage criteria and design flows for the San Francisquito Creek Flood Control Project.

Steelhead Passage Design Flows	Design Exceedance Flow for migration period, unless otherwise noted (EF)	Streamflow at Design EF(cfs)	Maximum Average Water Velocity (ft/s)	Depth Criteria (ft)
Adult High	5 percent	160	2	1
Adult Low	95 percent or 3cfs, whichever is greater.	3	2	1
Juvenile High	50 percent	5	1	0.5
Juvenile Low	95 percent on annual basis or 1cfs, whichever is greater	1	1	0.5

Steelhead passage conditions at the project specific design flows were assessed by NMFS in the flood control reach using HEC-RAS model results for flows close to the design flows listed in Table 3 which were provided by the SCVWD and SFCJPA. The HEC-RAS results predict the water surface elevations, channel depths, and water velocities at various river stations throughout the project reach for the proposed design. In some instances, cross sections of the channel were provided to illustrate water surface elevation profiles in the reach at certain flows. NMFS requested HEC-RAS results for both the Mean Lower Low Water (MLLW) and Mean Higher High Water (MHHW) tidal stages.

During the MHHW tide stage, tidal backwater extends upstream of the project reach creating suitable passage conditions for juveniles and adults. Tidal backwater also extends upstream of the project reach at the Mean Tide Level (MTL) and all the tidal stages between the MTL and MHHW. NMFS assumes the tidal backwater effect creates suitable fish passage conditions at all tidal stages between MTL and MHHW. This constitutes about 12 hours of the daily tidal cycle.

During the lower end of the tidal cycle (between MLLW and MTL) tidal backwater extent varies between STA 2+27 and the upstream end of the project. This constitutes about 12 hours of the daily tidal cycle. Based on the HEC-RAS results, high design flow stream velocities will exceed the 2 ft/s velocity threshold at some locations during the lower tidal range (MLLW to MTL). To provide hydraulic breaks and resting areas for upstream migrating adult steelhead, the project has proposed the installation of five complex rootwad and boulder structures in the low flow channel between STA 28+97 and 46+07. An additional rock spur structure will also be installed at the downstream tip of Friendship Bridge Island. The rock spur structure will extend into the low flow channel and function as a partial weir. These features have been incorporated into the channel design to function as an analog for native historic velocity refuges and would also provide cover and other habitat benefits for adult and juvenile steelhead. These structures will be strategically placed to avoid excessively long reach(es) with relatively swift water velocities and no resting opportunities. As a result, adult steelhead are expected to ascend the flood control channel at the high design fish passage flow (5 percent exceedance flow) under all tidal conditions.

For the upstream passage of juvenile steelhead, the high design flow stream velocities are anticipated to consistently exceed the 1 ft/s velocity threshold during the low tidal range. This may result in an excessively long reach(es) with relatively swift water velocities at high stream flows and no velocity refuge. Under low flow conditions during periods of low tide, water depths in the channel are not expected to meet the 0.5 ft criterion, and very shallow water depths could impede the movement of steelhead juveniles. However, at this downstream location in San Francisquito Creek, steelhead juveniles are anticipated to be primarily smolts and actively moving downstream. Upstream movement in this reach of stream is not essential since they have reached the tidally-influenced portion of San Francisquito Creek and they are generally committed at this stage to passing into San Francisco Bay, and subsequently the Pacific Ocean. The majority of smolts will likely be moving through the action area during periods of moderate and high flows in the spring when passage conditions are anticipated to be adequate for downstream passage to San Francisco Bay. Under low flow conditions, the alluvial reaches of San Francisquito Creek upstream of the action area experience very shallow depths and smolts will unlikely be descending into the project reach under these conditions. Therefore, the hydraulic and geomorphic conditions in the action area as a result of the Project are not expected to adversely affect smolt steelhead emigrating through the action area.

For green sturgeon, NMFS did not conduct a fish passage assessment because sturgeon are not expected to ascend San Francisquito Creek. Adult and juvenile green sturgeon may enter and depart the project reach during periods of high tide when adequate water depths allow sturgeon access into the project area. No impediments to the passage of green sturgeon in the action area are anticipated by project construction.

2.4.1.2. Dewatering and Fish Relocation

To protect water quality, and avoid direct and indirect mortality of fishes from construction activities, SFCJPA will bypass stream flow around the work area and dewater the work site in areas where in-stream work occurs. The project will require channel dewatered during up to two consecutive dry seasons. A vast majority, if not all, of the water present during the summer months would be tidal waters. The SFCJPA will submit a final dewatering and fish relocation plan to NMFS and the Corps prior to construction. This plan will provide a detailed description of the methods that will be employed, individuals conducting the work, dewatering sites, and relocation sites. All construction will occur during the summer low-flow between June 15 and October 15.

Stream flow diversions and dewatering is expected to cause temporary loss, alteration, and reduction of aquatic habitat, including critical habitat, in the action area. Dewatering activities could harm individual juvenile steelhead and green sturgeon by concentrating or stranding them in residual wetted areas (Cushman 1985) before they are relocated. Juvenile steelhead and green sturgeon could be killed or injured during dewatering activities, though direct mortality is expected to be minimal due to relocation efforts prior to installation of the bypass system. The proposed bypass system, which isolates the work areas to be dewatered; will allow stream flow in the San Francisquito Creek to continue flowing downstream.

Before the project site is dewatered, a qualified biologist will capture fish and relocate them away from the project work site to avoid direct mortality and minimize possible impacts during project dewatering and construction of the work site. Fish in the immediate project area will be captured by seine and/or dip net, and then transported and released at an appropriate location. Electrofishing will not be used to capture fish due to potentially high salinity/conductivity levels in the tidal channel. Data to precisely quantify the amount of steelhead that will be relocated prior to construction are not available. However, based on the proposed timing of project construction, NMFS can narrow the life-history-stage to juvenile steelhead because in-channel work activities will occur during the summer low-flow period after emigrating steelhead smolts have left and before adult migration has been initiated. In addition, the project reach is tidally-influenced and the presence of juvenile steelhead during the summer months in this area is expected to be low. However, the areas to be de-watered for project construction are large and the project reach includes 1.5 miles of lower San Francisquito Creek. Therefore, the steelhead that are likely to be captured during relocation activities should not exceed 20 pre-smolting juveniles, each year of construction. Based on distribution data and foraging habits of green sturgeon, their occurrence in the action area is assumed to be rare. Therefore, no individual green sturgeon are anticipated to be captured during relocation activities, each year of construction.

Fish capture and relocation activities pose a risk of injury or mortality to fish species. Fish collecting gear, whether passive (Hubert 1996) or active (Hayes *et al.* 1996) has some associated risk to fish, including stress, disease transmission, injury, or death. The amount of unintentional injury and mortality attributable to fish capture varies widely depending on the method used, the ambient conditions, and the expertise and experience of the field crew. Since fish relocation activities will be conducted by qualified fisheries biologists, direct effects to and mortality of steelhead during capture are expected to be minimized. Data from years of similar salmonid relocation activities indicate that average mortality rate is below one percent (Jeffrey Jahn, NMFS, personal communication, November 2015). Based on this information, NMFS will use 2 percent as the maximum amount of mortality likely from fish relocation for the project, or no more than one fish, each year of construction.

Fish collection is unlikely to be 100-percent effective at removing all individuals, but experienced biologists are expected to remove approximately greater than 95 percent of the fish present. Juvenile steelhead that evade capture and remain in the project area will likely be lost to desiccation or thermal stress during dewatering activities. This will result in the mortality of one steelhead, each year of construction.

Fish encountered during dewatering will be relocated to a downstream or upstream location in similarly brackish conditions. Because the project is located adjacent to the San Francisco Bay, fish relocated downstream will have direct access to ample Bay habitats and adjacent fringe marshes. Fish relocated upstream may endure short-term stress from crowding at the relocation sites. Relocated fish may also have to compete with resident fish for available resources such as food and habitat. Some of the fish released at the relocation sites may choose not to remain in these areas and may move either upstream or downstream to areas that have more habitat and a lower density of fish. As each fish moves, competition remains either localized to a small area or quickly diminishes as fish disperse. NMFS cannot accurately estimate the number of fish affected by competition, but does not believe this impact will affect the survival chances of individual fish or cascade through the watershed population of these species based on the small area that will likely be affected and the small number of steelhead likely to be relocated. As a result, fish are not expected to experience crowding or any reductions in fitness from relocation.

Another manner by which juvenile steelhead and green sturgeon may be harmed or killed during dewatering activities is to be entrained into pumps or discharge lines if these methods are used. To eliminate this risk, the SFCJPA will screen all pumps according to NMFS criteria, to ensure juvenile steelhead and green sturgeon will not be harmed by the pumps during dewatering events.

Juvenile steelhead and green sturgeon foraging within the action area may be inadvertently affected by the loss of benthic aquatic macroinvertebrate production associated with construction disturbance. However, effects to aquatic macroinvertebrates resulting from dewatering will be temporary because construction activities will be limited to the summer period during two consecutive years, drift from upstream will continue through the bypass pipes, and rapid recolonization (about two to three months) of disturbed areas by macroinvertebrates is expected following construction (Cushman 1985; Harvey 1986; Thomas 1985). Furthermore, the project area is located in the tidally-influenced reach of San Francisquito Creek, so benthic aquatic organisms from San Francisco Bay are likely to rapidly recolonize the action area from sources downstream of the project area. Based on the foregoing, the temporary loss of aquatic macroinvertebrates as a result of dewatering activities and channel disturbances is not expected to adversely affect juvenile steelhead or green sturgeon.

2.4.1.3. Construction Related Impacts on Water Quality

Water Quality. In-stream and near-stream construction activities may cause temporary increases in turbidity (reviewed in Furniss *et al.* 1991, Everest *et al.* 1991, and Spence *et al.* 1996), reductions in dissolved oxygen, changes to pH, and other alterations in water quality. NMFS anticipates only short-term changes to ambient water quality conditions will occur during proposed activities (*e.g.,* construction and removal of cofferdams and the initial re-wetting of the channel following the removal of the diversion). High concentrations of suspended sediment can disrupt normal feeding behavior and efficiency (Berg and Northcote 1985; Bjornn *et al.* 1977; Cordone and Kelley 1961), reduce growth rates (Crouse *et al.* 1981), and increase plasma cortisol levels (Servizi and Martens 1992). High turbidity concentrations can reduce dissolved oxygen in the water column, result in reduced respiratory functions, reduce tolerance to diseases, and can also cause fish mortality (Berg and Northcote 1985; Gregory and Northcote 1993; Sigler *et al.* 1984; Waters 1995). Even small pulses of turbid water will cause salmonids to disperse from established territories (Waters 1995), which can displace fish into less suitable habitat and/or increase competition and predation, decreasing chances of survival.

The SFCJPA will ensure water quality during construction will meet RWQCB and SWRCB water quality standards by monitoring water quality at reference sites and works sites at regular time intervals and implementing BMPs (see Sections 1.3.6 and 1.3.9). Water quality will remain close to ambient conditions. These slight alterations to water quality may cause minor behavioral changes (Henley *et al.* 2000), but are not expected to result in injury or mortality (immediate or latent) of fish. Behavioral changes will likely materialize as fish temporarily vacating preferred habitat or temporarily reduced feeding efficiency. These temporary changes in behavior, may reduce growth rates, but are not likely to reduce the survival chances of individual juveniles. Water quality alteration is expected to be limited to the immediate area of construction activities plus varying distances up and downstream (depending on the tidal stage). Fish will be able to move from the areas where degraded water quality may occur to the ample Bay habitats and fringing tidal marshes nearby. Therefore, any short-term impacts associated with changes in water quality during implementation of this project are expected to be insignificant.

Toxic Chemicals. Equipment refueling, fluid leakage, equipment maintenance, and road surfacing activities near the stream channel pose some risk of contamination of aquatic habitat and subsequent injury or death to listed salmonids. The SFCJPA and its contractors propose to maintain any and all fuel storage and refueling site in an upland location well away from the stream channel; that vehicles and construction equipment be in good working condition, showing no signs of fuel or oil leaks, and that any and all servicing of equipment be conducted in an upland location. For instream construction activities, NMFS does not anticipate any localized or appreciable water quality degradation from toxic chemicals or adverse effects to steelhead or green sturgeon associated with the proposed project, as the stream will be dewatered, giving the SFCJPA and its contractors ample opportunity to attend to any spill prior to toxic chemicals reaching the waters of San Francisquito Creek. NMFS anticipates proposed BMPs and responses by the SFCJPA and its contractors to any accidental spill of toxic materials should be sufficient to restrict the effects to the immediate area and not enter the waterway. Therefore, any short-term impacts associated toxic chemicals during implementation of this project are expected to be insignificant.

2.4.2. Effects on Critical Habitat

Designated critical habitat for Southern DPS green sturgeon and CCC steelhead occurs in the action area. The Project may impact designated critical habitat for these species by maintaining the existing condition of minimal natural cover, altering water quality, and temporarily reducing foraging habitat.

2.4.2.1. Natural Cover

Tidal salt marsh vegetation is found throughout the action area. Tidal salt marsh habitat is primarily supported by tidal exchange. Dominant plant species in the tidal salt marsh community include Pacific cordgrass (*Spartina foliosa*), pickleweed, perennial peppergrass (*Lepidium latifolium*), gumplant (*Grindelia stricta*), and alkali heath (*Frankenia salina*). Narrow bands of brackish tidal marsh are present along a few-hundred-foot section of San Francisquito Creek downstream of East Bayshore Road. In the brackish marsh, bulrush (*Schoenoplectus* sp.) is the dominant species rather than cordgrass and pickleweed. Ruderal vegetation intergrades with salt marsh species along the levee banks.

A total of 4.51 acres of tidal salt marsh vegetation will be impacted by construction of the Project. Impacts to tidal salt marsh are primarily from excavation of accumulated sediments on both sides of the channel and the relocation of approximately 1,100 feet of tidal channel. Excavation of sediments will result in the removal of 2.82 acres of tidal salt marsh vegetation. Additional tidal salt marsh vegetation will be removed for: creating roads for construction access (1.33 acres); filling in the low spot of the Faber Tract levee and improving the slope of the levee (0.35 acres); and degrading the Bay Levee (0.01 acres). After project construction is complete, the tidal marsh area would be terraced and revegetated with high-marsh plants appropriate to the elevation relative to tidal levels in accordance with the MMP for the Project (SFCJPA 2015c). Approximately 19,600 native wetland plants and cuttings are planned for installation. Plants will be sourced from the San Francisquito Creek watershed and Baylands areas. The SFCJPA also proposes to install 5 large debris jam structures within the channel to improve adult steelhead passage. These structures are anticipated to provide cover in the form of large woody debris and depth.

Removal of tidal salt marsh vegetation during construction could temporarily reduce the amount of cover utilized by steelhead for protection from predators. The reduction of in-channel vegetation may also temporarily reduce invertebrates in the channel by limiting their food source or substrate in which they live. Similarly, by disturbing the bed and banks of the channel, sediment removal may bury aquatic insects that steelhead and green sturgeon feed on. Overhanging and submerged vegetation provides hiding cover (protection from predators) and disturbance for adult salmonids during their migrations (Bisson *et al.* 1987; Bjornn and Reiser 1991a). Removal of this vegetation exposes them to predation and disturbance. Furthermore, removing vegetation has the potential to reduce the amount of velocity refuges available for adults and juveniles during high stream flow events.

NMFS expects the impacts on natural cover from construction of the Project will significantly reduce the already limited amount of natural cover for steelhead or green sturgeon until re-establishment of vegetation occurs. Installation of the debris jams will improve natural cover for fish within an approximate 2000 linear foot section of the channel. NMFS expects the impacts on natural cover will adversely affect PCEs of steelhead and green sturgeon for the short-term due to the large size of the construction area. Following vegetation reestablishment, PCEs and physical and biological features of critical habitat will be restored to near their current degraded state, and is expected to improve because of the increase in natural cover that will be provided by the debris jams.

The Project proposes to construct the levees, channel, and marshplains to resemble its current condition which is degraded from its historical condition described in Section 2.3.1. Major re-routing of the lower reaches took place in the late 1920s, with levees constructed on both sides of the creek for flood control and development purposes (Hermstad 2009). Constriction of the marsh within a narrow corridor has led to the current condition of a simplified channel and homogenous marshplain, with no side channels, deep pools, or large woody debris to provide natural cover for fish. Installation of five debris jams will improve habitat complexity in the channel. Overall, NMFS believes the proposed Project will improve the current degraded condition of natural cover for steelhead and green sturgeon in the action area.

Future maintenance activities will be limited to levee maintenance, vegetation management, and removal of trash and debris. Maintenance of the levee will employ best management practices to avoid impacts to the surrounding areas and channel. Ongoing maintenance that will be covered by the Project is expected to have minimal impacts on natural cover for steelhead and green sturgeon since the Project only proposes to remove vegetation along the levees. These activities will be located away from the channel, where steelhead and green sturgeon are expected to occur the majority of the time. Therefore, ongoing maintenance in the form of mowing vegetation along the levees is not expected to affect natural cover for steelhead or green sturgeon in the action area.

2.4.2.2. Water Quality

The effects of the Project on water quality were discussed above in section 2.4.1.3 of this opinion and also apply to the critical habitat within the action area. As described above, the effects of the proposed project may result in increased levels of turbidity, reductions in dissolved oxygen, changes to pH, and other water quality alterations. NMFS does not expect the impacts on water quality will adversely affect PCEs and physical and biological features of steelhead or green sturgeon because alterations to water quality will be associated with construction activities which will be temporary. Water quality is expected to remain near ambient levels as a result of the SFCJPA implementing BMPs and monitoring water quality during construction.

2.4.2.3. Foraging

The Project proposes to remove a significant amount of sediment and vegetation during excavation of the channel. Disturbance to benthic habitat from excavation will result in the direct removal of prey resources (*e.g.*, entrained with sediment and vegetation) or the displacement of preferred forage species due to habitat disturbances. These impacts are expected to persist throughout the two-year construction timeframe and extend up to five years beyond the completion of the Project while vegetation is re-establishing.

As described in Section 2.3.2.1 of this opinion, habitat in the action area is degraded and does not contain attributes that would likely support extended foraging by steelhead or green sturgeon. NMFS does not consider the action area a primary foraging site for green sturgeon or steelhead and the impacts incurred from the Project will not likely have a substantial impact on the current value of this habitat to steelhead or green sturgeon. Sturgeon and steelhead likely already use other areas in South San Francisco Bay as preferred foraging sites, and will continue to do so when project construction is completed. Nonetheless, the Project will result in significant alterations to marsh vegetation and the channel benthos for up to two years during construction and five years during marsh vegetation re-establishment. This is expected to reduce the amount of already degraded forage opportunities for green sturgeon during this time. After construction is complete and vegetation re-establishes, forage will likely return to current levels, and may slightly improve as a result of the Project's channel widening in some locations and vegetation management and monitoring activities. Based on this information, NMFS concludes that Project is likely to reduce the quality of the PCEs and physical and biological features for green sturgeon and steelhead critical habitat within the action area over the short-term (seven years), with the potential for minor improvements to the quality of PCEs in the long-term.

2.5 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR §402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

2.5.1. Searsville Dam and Reservoir

Searsville Dam and Reservoir are owned and operated by Stanford University on lower Corte Madera Creek approximately 12 mile upstream of the action area. Construction of Searsville Dam on lower Corte Madera Creek was completed in 1892 by Spring Valley Water Company, and in 1919 the reservoir and some surrounding property became part of the Stanford University. Searsville is a year-round water storage and diversion facility.

Although Searsville Dam is upstream of the action area, sediment transported over the dam is predicted to affect the channel within the action area of this Project. Searsville Reservoir is rapidly filling with sediment due to historical and current episodes of erosion. Stanford is currently reviewing their potential future management options for Searsville Dam and Reservoir, but Stanford has not identified a future course of action. In the absence of future actions by Stanford, the natural filling of Searsville Reservoir will continue until equilibrium between sediment inflow and sediment outflow is reached (Northwest Hydraulic Consultants *et al.* 2002). 2002). Once Searsville Reservoir fills with sediment, Northwest Hydraulic Consultants, Inc. (Northwest Hydraulic Consultants *et al.* 2002) predict bedload consisting primarily of sand will be transported over the dam for the first time in more than 100 years.

The San Francisco District Corps of Engineers Water Resources Section evaluated what specific changes are expected to occur within the action area as a result of Searsville Dam filling with sediment (Corps 2011). The study used the predicted channel bed elevation changes from the (Northwest Hydraulic Consultants *et al.* 2002) study to model a "with-sediment" flow scenario in the action area. Northwest Hydraulic Consultants *et al.* (2002) predicted an average channel bed change of 1.24 feet from sediment deposition over a 70-year period. The Corps' study results predict sediment deposition in the action area may increase flood flow depths by up to 1.5 feet in some locations of the action area during the 100-year flood event (Corps 2011). Deposition of sediment at this volume will not require sediment removal since the project has been designed to accommodate flow elevation increases associated with the predicted 1.24 foot average bed elevation increase.

Periodic sediment removal at current baseline volumes is anticipated as a future maintenance need and will be conducted under the auspices of the SCVWD SMP. Information from SCVWD maintenance records shows removal of approximately 1,200 to 5,300 cubic yards of sediment from the project reach at variable intervals (1- 4 years) between 2000 and 2013. The cumulative effect of sediment originating from Searsville Reservoir could increase, from the current baseline, the frequency and volume of material periodically removed. However, per SCVWD's SMP, sediment removal in San Francisquito Creek will not exceed 300 linear feet along the channel bed and will not exceed the maintenance baseline established by the relevant Maintenance Guidelines. If additional sediment is deposited with the flood channel reach during high flow events, additional sediment removal may be required to maintain the Project's design flow conveyance capacity, yet it would not be covered under the Corps permit for this Project.

Sediment removed by excavation of the channel per the SCVWD SMP is expected to disturb benthic habitat and result in the direct removal of prey resources (*e.g.*, entrained with sediment and vegetation) or the displacement of preferred forage species due to habitat disturbances. However, excavation would occur in relatively small sections of the channel (300 linear feet or less) and be restricted to volumes similar to baseline excavation volumes. Since the project area is located in the tidally-influenced reach of San Francisquito Creek, benthic aquatic organisms from San Francisco Bay are expected to rapidly recolonize the action area from sources downstream following sediment excavation events. Juvenile steelhead and green sturgeon foraging within the action area may be inadvertently affected by the temporary loss of benthic aquatic macroinvertebrate production associated with disturbance by sediment removal activities; however the effect is not expected to be significant due to the localized and short-term nature of the impact, and that adequate foraging areas adjacent to the action area remain available and undisturbed.

2.5.2. Climate Change

The long-term effects of climate change have been presented in the Section 2.3.2.3 - Factors Affecting Species Environment within San Francisquito Creek and the Action Area of this biological opinion. These include changes in streamflow regimes, water temperatures, and rainfall patterns. Climate change poses a threat to CCC steelhead and Southern DPS green sturgeon within the action area. The current climate in the action area is generally warm, and modeled regional average air temperatures show an increase in summer (Lindley *et al.* 2007) and greater heat waves (Hayhoe *et al.* 2004). The likely change in amount of rainfall in Northern and Central Coastal streams under various warming scenarios is less certain, total rainfall across the state is expected to decline. For the California North Coast, some models show large increases (75 to 200 percent) in precipitation while other models show decreases of 15 to 30 percent (Hayhoe *et al.* 2004). Sea level rise of 16 inches in San Francisco Bay could extend the area of tidal-influence in lower San Francisquito Creek upstream by approximately one mile and (BCDC 2007) convert portions of high marsh habitat (elevations of 0.2 to 0.3 meters) in the lower 0.5 mile of stream to mid marsh habitat (elevations of -0.2 to 0.1 meters) (Point Reyes Bird Observatory Conservation Science 2012).

Steelhead rearing and migratory habitat are most at risk to climate change. Increasing water temperatures and changes in the amount and timing of precipitation will impact water quality, streamflow levels, and steelhead migration. Low and warm summer flow conditions will negatively affect juvenile steelhead growth and survival. The upstream migration of adult steelhead will be impeded by low stream conditions during winter months, as well as, excessively high streamflows during large winter precipitation events. Smolt outmigration may be constrained by fewer or lower spring high flow events. Climate change is also anticipated to result in further ocean acidification and changes in ocean prey availability (Feely *et al.* 2008; Portner and Knust 2007) which would also negatively impact adult steelhead in the marine environment. Overall, the range and degree of variability in ambient temperature and precipitation are likely to increase due to climate change, and these predictions further highlight the importance of providing suitable instream habitat diversity/complexity in the streams and estuaries where CCC steelhead DPS and southern DPS green sturgeon occur.

2.6 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (section 2.4) to the environmental baseline (section 2.3) and the cumulative effects (section 2.5), taking into account the status of the species and critical habitat (section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species.

CCC steelhead and southern DPS green sturgeon have experienced serious declines in abundance, and long-term population trends suggest a negative growth rate. Human-induced factors have reduced populations and degraded habitat, which in turn has reduced the population's resilience to natural events, such as droughts, floods, and variable ocean conditions. Global climate change presents another real threat to the long-term persistence of these populations, especially when combined with the current depressed population status and human caused impacts. Within the project's action area in the effects of channelization and urban development are evident. These activities have contributed the lack of emergent marsh and reduced channel complexity (*i.e*., floodplain extent and side channels) in the action area. As a result, forage species that listed salmonids and green sturgeon depend on have been reduced, stream hydrology and hydraulics have been altered, and natural cover characteristic of intact complex tidal salt marshes (*e.g*., deep pools, side channels, and woody debris) have been eliminated.

Construction of the Project will occur during two consecutive construction seasons between June 15 and October 15, when CCC steelhead juveniles may be present within the action area. Based on distribution data and foraging habits of green sturgeon, their occurrence in the action area is assumed to be rare. Therefore, no individual green sturgeon are anticipated to be encountered during dewatering and fish relocation activities. The Project has the potential to affect juvenile steelhead during construction through injury or mortality during fish capture and relocation, desiccation during dewatering, and degradation of water quality. The project has the potential to adversely impact natural cover, water quality, and forage features of CCC steelhead and southern DPS green sturgeon critical habitat.

The Project proposes to build one simplified channel, with relatively narrow floodplains. Although most of the project reach will contain minimal structural complexity, the Project has proposed to construct six structures in the channel for the purpose of creating hydraulic velocity breaks which will serve as both resting areas for upstream migrating steelhead and provide instream cover. The general lack of channel complexity will resemble the current channel configuration, which is a product of historical flood control and development activities in the action area. The Project will slightly widen the flood control channel and recreate marshplains throughout the action area. These actions are expected to provide minor improvements to the current degraded habitat condition within the action area.

The Project proposes to dewater and relocate juveniles steelhead from the action area prior to construction each season. Experienced fish biologists are expected to work effectively to collect and relocate juvenile steelhead. Based on the low mortality rates for similar dewatering and fish relocation efforts, NMFS anticipates few juvenile steelhead will be harmed or killed during implementation of this project. The maximum number of individuals likely to be encountered by the project over the two year construction window is 40 pre-smolting juvenile steelhead. Anticipated mortality from relocation activities are expected to not exceed two (2) percent of the total likely to be encountered each construction season (*i.e*., one individual juvenile steelhead each year). Fish that elude capture and remain in the project area during construction activities will likely be lost to thermal stress or crushed by heavy equipment, but this number is not expected to exceed five (5) percent of the fish within the area dewatered each construction season (*i.e*., one individual juvenile steelhead each year). In total, NMFS expects no more than four (4) juvenile steelhead will be harmed or killed by this project's fish relocation and dewatering. Due to the relatively large number of juveniles produced by each spawning pair, steelhead spawning in the San Francisquito Creek watershed in future years are expected to produce enough juveniles to replace the few that may be lost at the project site due to relocation and dewatering. It is unlikely that the small potential loss of juveniles by this project will impact future adult returns.

During construction, water quality in the action area may be degraded through temporary increases in turbidity, reductions in dissolved oxygen, changes to pH, introduction of toxic chemicals, and other alterations to ambient water conditions. However, due to the implementation of BMPs these water quality alterations are not expected to occur at levels known to cause reductions in fitness to listed fish. Alterations to water quality during construction will be temporary and similar to the natural conditions typically encountered by listed fish (close to ambient conditions). Furthermore, steelhead will have been relocated from work sites and green sturgeon are not expected to be present during construction so their exposure to altered water quality conditions is unlikely. If fish do encounter water quality alterations, they will likely result in minor and temporary changes to fish behavior (*i.e.*, avoidance), and are not expected to adversely affect green sturgeon or steelhead.

The action area experienced major re-routing in the late 1920s, with levees constructed on both sides of the creek for flood control and development purposes (Hermstad 2009). Constriction of the marsh within a narrow corridor has led to the current condition of a simplified channel and homogenous marshplain, with no side channels, deep pools, or large woody debris to provide natural cover for fish. This has led to an overall degraded condition of PCEs and physical and biological features of green sturgeon and steelhead critical habitat. Construction of the Project will have short-term (two years) adverse impacts on critical habitat through the direct disturbance of benthic prey items, natural cover, water quality, and passage conditions. After project construction is complete, the tidal marsh area would be terraced and revegetated so construction impacts will dissipate within the five year vegetation reestablishment period. The SFCJPA also proposes to install five large debris jam structures within the channel to improve adult steelhead passage. These structures are anticipated to provide cover in the form of large woody debris and depth. Installation of the debris jams will improve natural cover for fish within an approximate 2000 linear foot section of the channel. Following vegetation reestablishment, PCEs and physical and biological features of critical habitat will be restored to near their current degraded state, and is expected to improve because of the increase in natural cover that will be provided by the debris jams.

For steelhead, the action area serves as an essential migration corridor to and from one of the few remaining steelhead populations in tributaries to South San Francisco Bay. Migration for steelhead through the completed Project will be adequate, and may improve over current conditions by the addition of the instream wood structures. Also, the project will not reduce the ability of green sturgeon to move into and out of lower San Francisquito Creek. The Project's impacts on forage, and cover features in the action area will result in temporary reduction in steelhead critical habitat value in the action area, yet because of its limited scope and duration, the impacts to critical habitat in the action area will not appreciably reduce the critical habitat value for CCC steelhead.

The current ecological distribution of green sturgeon in the Bay suggests that the action area is not of prime importance for this species. NMFS anticipates no direct impact to green sturgeon during construction of this project. The Project's impacts to aquatic habitat will not result in an appreciable reduction in critical habitat value in the action area or at entire critical habitat designation scale for southern DPS green sturgeon.

The cumulative effects of the operation of Searsville Dam and Reservoir are anticipated to affect CCC steelhead and designated critical habitat in the future in a manner similar to the present day impacts on steelhead and critical habitat in the action area. Sedimentation rates in the action area are only expected to increase slightly once Searsville Reservoir fills with sediment and the annual sediment loads from the upper watershed move past the reservoir to downstream reaches. The predicted changes in bed elevations (plus 1.24 feet) and flood elevations (plus 1.5 feet) within the action area as a result of the filling of Searsville Reservoir (Corps 2011) are not expected to appreciably reduce steelhead or green sturgeon critical habitat value within the action area.

Regarding future climate change effects in the action area, California could be subject to higher average summer air temperatures and lower total precipitation levels. The Sierra Nevada snow pack may decrease by as much as 70 to 90 percent by the end of this century under the highest emission scenarios modeled. Reductions in the amount of precipitation would reduce streamflow levels in Northern and Central Coastal rivers. Estuaries may also experience changes in productivity due to changes in freshwater flows, nutrient cycling, and sediment amounts. For this project, construction would be completed no later than 2020 and the above effects of climate change are unlikely to be detected within that time frame. The short-term effects of project construction will have completely elapsed prior to these climate change effects.

2.7 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of threatened CCC steelhead and threatened southern DPS green sturgeon or destroy or adversely modify their designated critical habitat.

2.8 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR §222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

2.8.1. Amount or Extent of Take

The number of threatened CCC steelhead that may be incidentally taken during project activities is expected to be small, and limited to the juvenile (pre-smolt) life stage. Take is anticipated to occur during fish relocation and dewatering of construction reaches within the action area between June 15 and October 15 over two years of construction. The number of juvenile steelhead relocated during project construction is anticipated to be no more than 20 per year (40 for the entire two years of construction), and no more than two juvenile steelhead are expected to be injured or killed each year (4 for the entire two years of construction) during fish relocation and dewatering activities.

If more than 40 juvenile steelhead are captured, or more than 4 juvenile steelhead are injured or killed, incidental take will have been exceeded.

Based on distribution data and foraging habits of green sturgeon, their occurrence in the action area is assumed to be rare and no take of southern DPS green sturgeon is anticipated from the Project.

2.8.2. Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.8.3. Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

1. Ensure construction methods, minimization measures, operations and maintenance, and monitoring are properly implemented within the action area.

2. Ensure the steelhead habitat complexity features are designed in a manner that provide adequate resting and holding areas for steelhead migrants.

3. Undertake measures to ensure that harm and mortality to steelhead resulting from fish relocation and dewatering activities is low.

4. Prepare and submit a report to document effects of construction and relocation activities and performance.

5. Monitor and evaluate the performance of the habitat elements (RPM #2), revegetation, and channel morphology components of the project.

6. Prepare and submit reports to document the performance of habitat elements (RPM #2), revegetation, and channel morphology components of the project.

2.8.4. Terms and Conditions

The terms and conditions described below are non-discretionary, and the Corps or any applicant must comply with them in order to implement the reasonable and prudent measures (50 CFR §402.14). The Corps or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR §402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

All plans and reports mentioned below must be submitted to: NMFS North-Central Coast Office Attention: San Francisco Bay Branch Chief, 777 Sonoma Avenue, Room 325, Santa Rosa, California 95404-6528.

1. The following terms and conditions implement reasonable and prudent measure 1:

   a. The permittees must submit the Project's Final Operations and Maintenance Manual and Mitigation and Monitoring Plan for review and approval at least 90 days prior to construction of the Project.

   b. The SFCJPA will allow any NMFS employee(s) or any other person(s) designated by NMFS, to accompany field personnel to visit the project sites during construction activities described in this biological opinion.

   c. If any ESA-listed fish are found dead or injured, the biologist shall contact NMFS biologist Amanda Morrison to review the activities resulting in take and to determine if additional protective measures are required. All ESA-listed fish mortalities shall be retained, placed in an appropriately-sized sealable plastic bag, labeled with the date and location of collection, fork length measured, and be frozen as soon as possible. Frozen samples shall be retained by the biologist until specific instructions are provided by NMFS. The biologist may not transfer biological samples to anyone other than the NMFS North-Central Coast Office without obtaining prior written approval from the North-Central Coast Office, San Francisco Bay Branch Chief. Any such transfer will be subject to such conditions as NMFS deems appropriate.

2. The following terms and conditions implement reasonable and prudent measure 2:

   a. The permittees must submit the Project's 60 percent and 90 percent design plans for steelhead habitat features (*i.e.,* debris jams and rock weir) to NMFS for review and approval at least 90 days prior to the initiation of construction of the Project.

3. The following terms and conditions implement reasonable and prudent measure 3:

a. The permittees must submit the Project's Final Dewatering and Fish Relocation Plan(s) for review and approval at least 90 days prior to construction of each phase. The Plan(s) must clearly identify the proposed cofferdam locations and fish relocation methods.

b. All screens used on equipment meant to divert flows must be screened in accordance with the NMFS Fish Screening Criteria for Anadromous Salmonids [available at: http://swr.nmfs.noaa.gov/hcd/fishscrn.pdf] and the Addendum for Juvenile Fish Screen Criteria for Pump Intakes [available at: http://swr.nmfs.noaa.gov/hcd/pumpcrit.pdf].

c. The SFCJPA shall retain a qualified biologist with expertise in the areas of anadromous fish biology, including handling, collecting, and relocating salmonids and green sturgeon; salmonid and green sturgeon habitat relationships; and biological monitoring of salmonids and green sturgeon. The Corps shall ensure that all biologists working on this project be qualified to conduct fish collections in a manner which minimizes all potential risks to ESA-listed fish.

d. A qualified biologist shall monitor the construction site during placement and removal of flow diversions and cofferdams to ensure that any adverse effects to steelhead and green sturgeon are minimized. The biologist shall be on site during all dewatering events to ensure that all ESA-listed fish are captured, handled, and relocated safely. The biologist shall notify NMFS biologist Amanda Morrison at (707) 575-6083 or Amanda.Morrison@noaa.gov one week prior to capture activities in order to provide an opportunity for NMFS staff to observe the activities.

e. ESA-listed fish shall be handled with extreme care and kept in water to the maximum extent possible during relocation activities. All captured fish shall be kept in cool, shaded, aerated water protected from excessive noise, jostling, or overcrowding any time they are not in the stream and fish shall not be removed from this water except when released. To avoid predation, the biologist shall have at least two containers and segregate young-of-year fish from larger age-classes and other potential aquatic predators. Captured steelhead and green sturgeon must be relocated, as soon as possible, to a suitable in-stream or estuary location in which suitable habitat conditions are present and similar to capture sites to allow for adequate survival of transported fish and fish already present.

f. If any ESA-listed fish are found dead or injured, the SFCJPA must implement Term and Condition 1.c. listed above.

4. The following terms and conditions implement reasonable and prudent measure 4:

   a. The Corps and SFCJPA must provide a written report to NMFS by January 15 of each year following completion of the previous year's construction and fish relocation activities. The report must contain, at a minimum, the following information:

      (1) *Construction related activities.* The report must include the dates construction began and was completed; photographs taken before, during, and after the activity from photo reference points; a discussion of any unanticipated effects or unanticipated levels of effects on ESA-listed fish and their habitat, a description of any and all measures taken to minimize those unanticipated effects and a statement as to whether or not the unanticipated effects had any effect on ESA-listed fish or designated critical habitat; and, the number of ESA-listed fish killed or injured during the project action.

      (2) *Fish Relocation.* The report must include a description of the location from which fish were removed and the release site including photographs; the date and time of the relocation effort; a description of water quality at release sites at the time of release, including, at a minimum, water temperature and dissolved oxygen levels; a description of the equipment and methods used to collect, hold, and transport ESA-listed fish; the number of fish relocated by species; the number of fish injured or killed by species and a brief narrative of the circumstances surrounding ESA-listed fish injuries or mortalities; and a description of any problems which may have arisen during the relocation activities and a statement as to whether or not the activities had any unforeseen effects.

5. The following terms and conditions implement reasonable and prudent measure 5:

   a. The SFCJPA must conduct annual inspections of the Project by November of each year that evaluate the performance of fish habitat elements, vegetation re-establishment, and channel design performance as it relates to fish passage conditions, in addition to other elements inspected per the Project's Mitigation and Monitoring and Operations and Maintenance Plans.

6. The following terms and conditions implement reasonable and prudent measure 6:

   a. The Corps and SFCJPA must provide a written report to NMFS by February 1 of each year on the results of annual inspections. The report must include a discussion on the performance of fish habitat elements and channel design performance as it relates to fish passage conditions; a discussion of any unanticipated effects to fish passage or critical habitat; and a description of potential measures that will be taken to mitigate those effects.

2.9 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

NMFS has no Conservation Recommendations.

2.10 Reinitiation of Consultation

This concludes formal consultation for San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project. As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) the amount or extent of incidental taking specified in the incidental take statement is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSULTATION

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide effects, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the Corps and descriptions of EFH for Pacific coast groundfish (PFMC 2005), coastal pelagic species (PFMC 1998), and Pacific coast salmon (PFMC 1999) contained in the fishery management plans (FMP) developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

Effects of the proposed project will effect EFH for various federally managed fish species within the Pacific Coast Groundfish (PFMC 2005), Pacific Coast Salmon (PFMC 1999), and Coastal

Pelagic Species (PFMC 1998) FMPs. Furthermore, the project area is located in a Habitat Area of Particular Concern for various federally managed fish species within the Pacific Coast Groundfish FMP.

3.2 Adverse Effects on Essential Fish Habitat

Adverse effects to EFH for coastal pelagic species and Pacific groundfish will occur through (1) altered water quality, and (2) disturbance of benthic biological community, including removal of prey, and physical habitat. No adverse effects to EFH for Pacific salmon are anticipated.

3.2.1. Water Quality

As described in sections 2.4.1.3 and 2.4.2.2 of the biological opinion, in-stream and near-stream construction activities may cause temporary increases in turbidity (reviewed in Everest *et al.* 1991; Furniss *et al.* 1991; Spence *et al.* 1996), reductions in dissolved oxygen, changes to pH, and other alterations in water quality. NMFS anticipates only short-term changes to ambient water quality conditions will occur during proposed activities (*e.g.,* construction and removal of cofferdams and the initial re-wetting of the channel following the removal of the diversion). The SFCJPA will ensure water quality during construction will meet SFRWQCB and SWRCB water quality standards through monitoring and implementing BMPs (see Sections 1.3.6 and 1.3.9). Water quality will remain close to ambient conditions. Water quality alteration is expected to be limited to the immediate area of construction activities plus varying distances up and downstream (depending on the tidal stage). It is expected that fish species encountering the altered water quality conditions will react behaviorally and either move away from or avoid them. These effects are expected to be temporary and there is ample area for fish to move to near the action area.

3.2.2. Benthic disturbance

As described in Section 2.4.2.3 of the opinion, the Project proposes to remove a significant amount of sediment and vegetation during project construction. Disturbance to benthic habitat from excavation will result in the direct removal of prey resources (*e.g.*, entrained with sediment and vegetation) or the displacement of preferred forage species due to habitat disturbances. These impacts are expected to persist throughout the two-year construction timeframe and extend up to five years beyond the completion of the Project while vegetation is re-establishing.

The Project would result in benthic disturbance and potential removal of invertebrate prey within 4.5 acres of tidal salt marsh habitat from sediment removal and 2.4 acres of bay waters from channel realignment, for a total of 6.9 acres of soft substrate habitat. EFH species managed under the Coastal Pelagics and Pacific Groundfish FMPs forage on infaunal and bottom-dwelling organisms, such as polychaete worms and crustaceans. Excavation and dredging activities can adversely affect the benthic invertebrate community by directly removing or burying these organisms (Newell 2002; Van der Veer *et al.* 1985). The Project is likely to result in the temporary loss of EFH prey organisms due to construction activities.

Recolonization studies suggest that recovery (generally meaning the later phase of benthic community development after disturbance when species that inhabited the area prior to disturbance begin to re-establish) may not be quite as straightforward, and can be regulated by physical factors including particle size distribution, currents, and compaction/stabilization processes following disturbance. Rates of recovery listed in the literature range from several months to several years for estuarine muds (Currie and Parry 1996; McCauley *et al.* 1977; Tuck *et al.* 1998; Watling *et al.* 2001) to up to 2 to 3 years for sands and gravels (Gilkinson *et al.* 2005; Oliver *et al.* 1977; Reish 1961; Thrush 2002; Thrush *et al.* 1995; Watling *et al.* 2001). Thus, forage resources for fish that feed on the benthos may be substantially reduced before recovery is achieved. Based on available literature, NMFS will assume full recovery of prey resources will exceed one year following construction.

Additionally, the act of removing sediments and the associated biotic assemblages during construction of the Project creates an area of disturbance that is extremely susceptible to recolonization by invasive species, often resulting in the displacement of native species. As a result, the Project may result in the increased distribution and abundance of invasive species in the action area, which in turn would reduce the amount of native prey resources available to coastal pelagic species and groundfish in the action area.

3.3 Essential Fish Habitat Conservation Recommendation

To compensate for the temporal effects of benthic disturbance on 6.9 acres of soft bottom substrate during two years of construction and for an additional period of year or longer following construction, NMFS recommends the SFCJPA: (1) provide funding to an ongoing restoration project; (2) purchase credits from a conservation/mitigation bank; and/or (3) implement a new restoration project.

For any compensatory mitigation, the habitat replacement should be “in-kind”, such that the replacement habitat value is equal to, or greater than, pre-project habitat value. Determination of habitat replacement value should be based on the contribution of that habitat to the support of species and vegetation affected by the proposed project and be determined in coordination with NMFS.

Compensatory mitigation should occur on-site at an one-to-one mitigation ratio (*e.g.*, 15 acres restored:15 acres impacted) or off-site at a three-to-one mitigation ratio (*e.g*., 45 acres restored:15 acres impacted) and should be habitat replacement in-kind. Ratios greater than one-to-one to account for temporal losses, uncertainty of performance, and differences in functions or values in replacement habitats outside of the action area.

The amount of credits purchased from a conservation/mitigation bank should be equal to a three-to-one ratio, or greater, and should result in habitat replacement in-kind. If the credit system for a bank is not expressed and measured in the same manner as the impacts of proposed project, the SFCJPA should confer with NMFS to determine an acceptable amount of credits to be purchased. The amount of monies provided to a restoration project should be sufficient to fund one-to-one habitat restoration for projects in South San Francisco Bay, or three-to-one at off-site restoration sites.

Fully implementing this EFH conservation recommendation would avoid, minimize, or offset the adverse effects described in section 3.2, above, to approximately 6.9 acres of designated EFH for Pacific coast groundfish, and coastal pelagic species.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Corps must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR §600.920 (k)(l)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The Corps must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR §600.920 (l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the Corps. Other interested users could include the SFCJPA, SCVWD, USFWS, BCDC, and the SWQCB. Individual copies of this opinion were provided to the Corps. This opinion will be posted on the Public Consultation Tracking System web site (https://pcts.nmfs.noaa.gov/pcts-web/homepage.pcts). The format and naming adheres to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

5. FIGURES

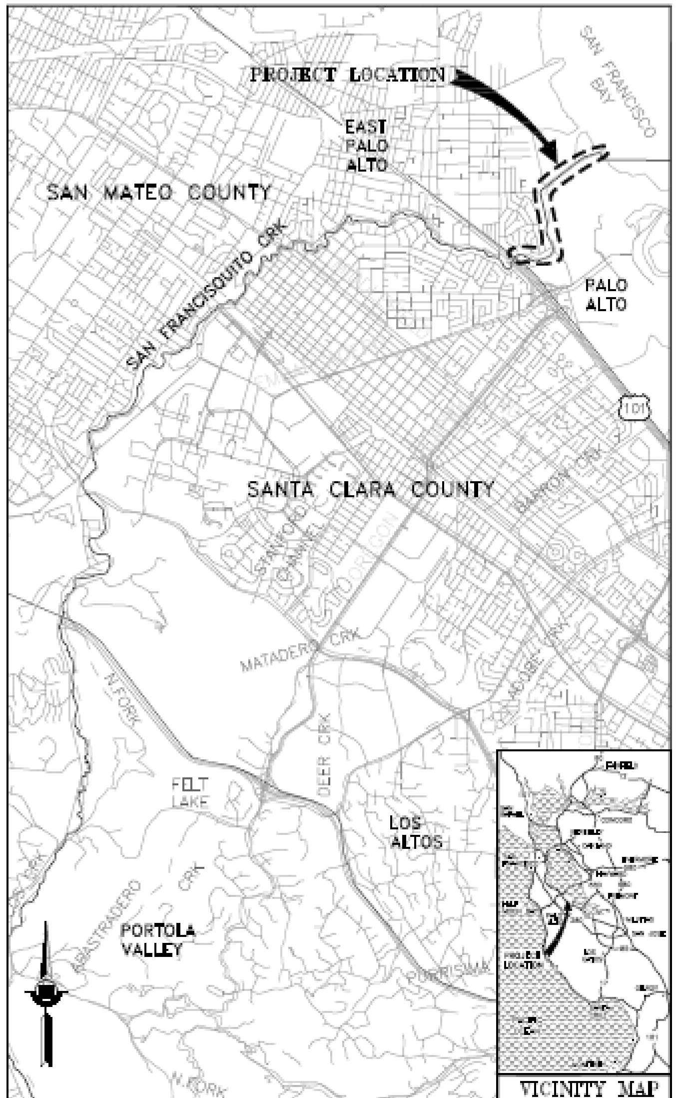

Figure 1. Map showing general location of the Project.

Figure 2. Map of entire project area.

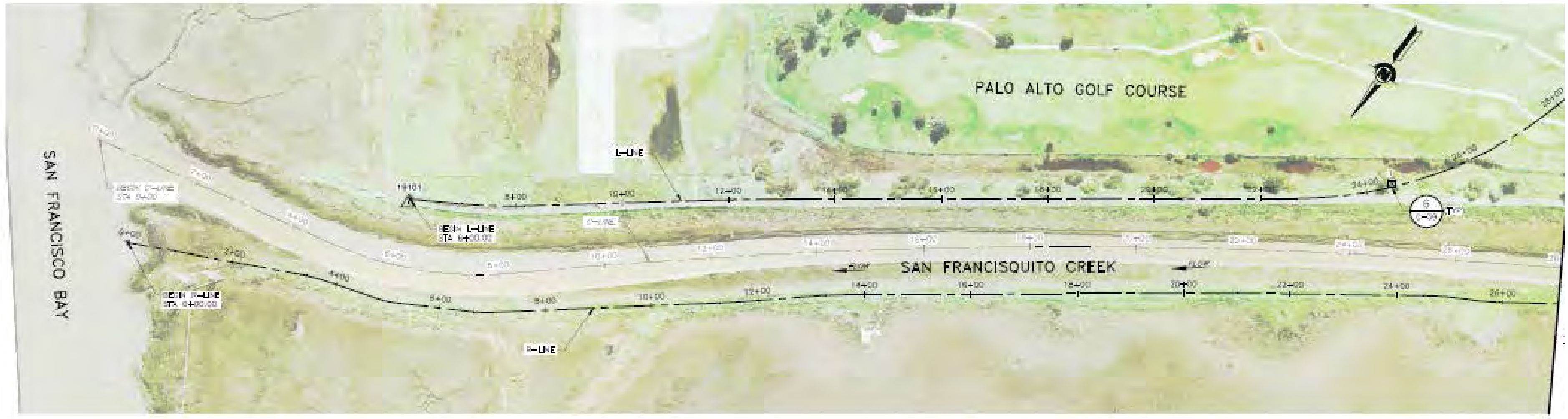

Figure 3. Map of project area from center line STA 0+00 to STA 28+00.

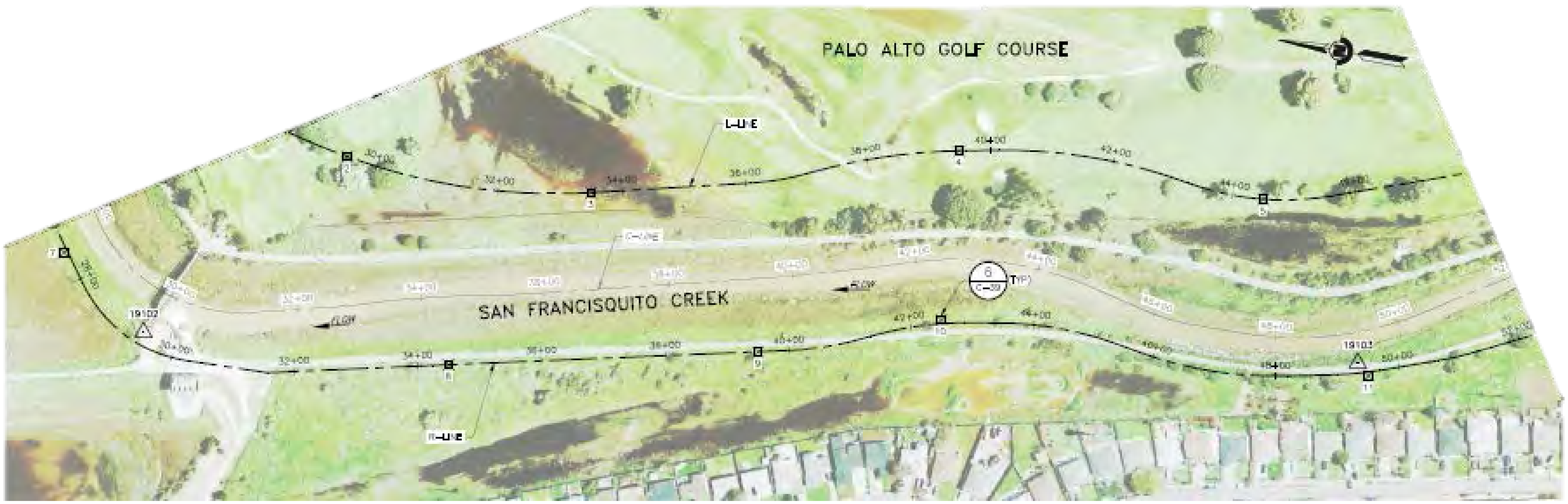

Figure 4. Map of project area from center line STA 28+00 to STA 52+00.

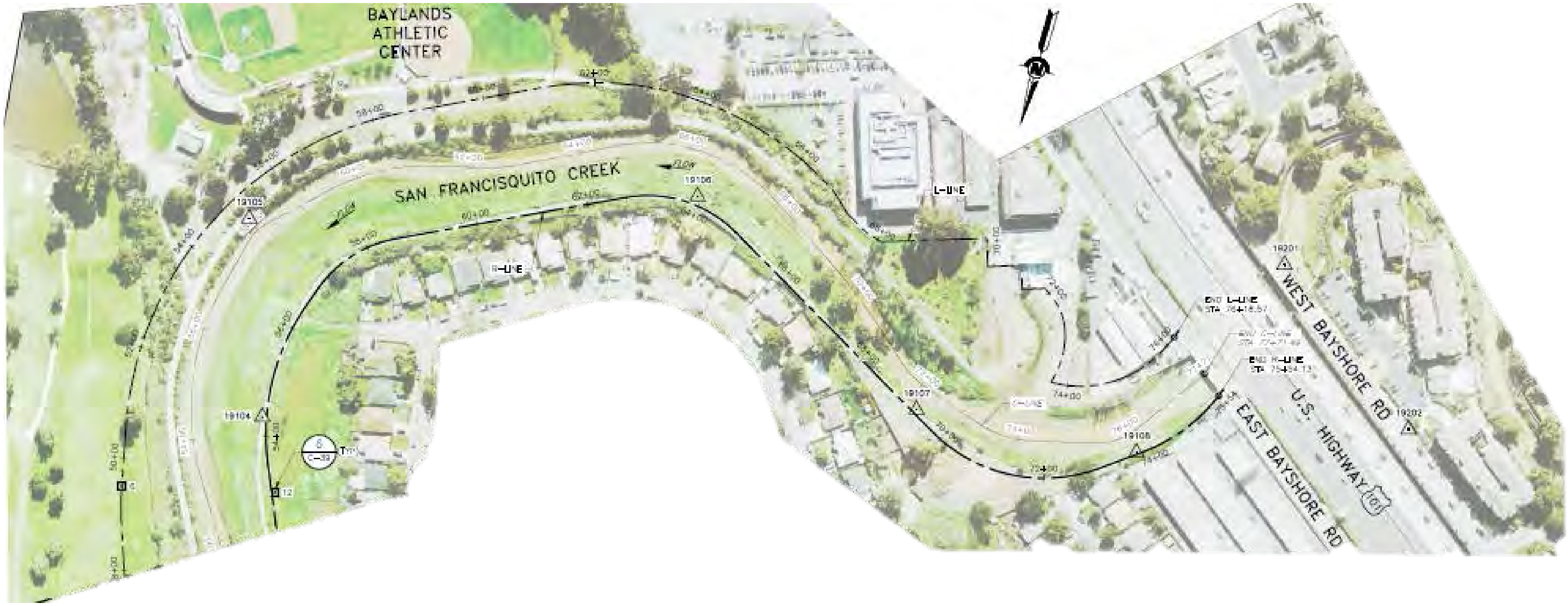

Figure 5. Map of project area from center line STA 52+00 to STA 77+71.

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Suite W-2605
Sacramento, California 95825-1846

In Reply Refer to:
08ESMF00-
2013-F-0401-R001

APR 2 9 2016

Mr. Aaron O. Allen
Attn: Greg Brown
Department of the Army
San Francisco District, U.S. Army Corps of Engineers
1455 Market Street
San Francisco, California 94103-1398

Subject: Reinitiation of Formal Consultation on the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, from San Francisco Bay to Highway 101, in the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California (U.S. Army Corps of Engineers (Corps) file number 2013-00030S)

Dear Mr. Allen:

This letter is in response to the Corps' April 20, 2016, request for reinitiation of formal consultation for the San Francisquito Creek Joint Powers Authority's (SFCJPA) proposed San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project (proposed project), from San Francisco Bay to Highway 101, in the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California (Corps file number 2013-00030S). Your request for reinitiation of consultation was received in our office on April 20, 2016. At issue are the proposed project's effects on the federally threatened California red-legged frog (*Rana draytonii*), endangered San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), threatened Pacific Coast population of the western snowy plover (western snowy plover) (*Charadrius alexandrinus nivosus*), endangered California clapper rail (*Rallus longirostris obsoletus*), endangered salt marsh harvest mouse (*Reithrodontomys raviventris*), endangered California least tern (*Sternula antillarum browni*), and endangered California seablite (*Suaeda californica*). Critical habitat has been designated for the California red-legged frog and western snowy plover but does not occur within the action area for the proposed project. This response is provided under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act), and in accordance with the implementing regulations pertaining to interagency cooperation (50 CFR 402).

Recent genetic analyses of rail species resulted in a change in the common name and taxonomy of the large, "clapper-type" rails (*Rallus longirostris*) of the west coast of North America to Ridgway's rail (*Rallus obsoletus*) (Maley and Brumfield 2013, Chesser *et al.* 2014). Thus the California clapper rail is now referred to in the scientific community as the California Ridgway's rail (*Rallus obsoletus obsoletus*). The change in the common name and taxonomy of the California clapper rail, however, does not change the listing status of the species.

In considering your request, we based our evaluation on the following: (1) the Service's biological opinion on the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation

Project from San Francisco Bay to Highway 101, in the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California (Service file number 08ESMF00-2013-F-0401), dated January 15, 2016; (2) the April 20, 2016, protocol-level survey report for the California clapper rail prepared by the Santa Clara Valley Water District (SCWD) and ICF International; (3) the April 25, 2016, electronic mail message from SFCJPA summarizing proposed project changes; and (4) electronic mail and conversations among the Corps, SFCJPA, SCVWD, California Department of Fish and Wildlife (CDFW), Don Edwards San Francisco Bay National Wildlife Refuge (Refuge), and the Service.

The following additions are made to the **Consultation History** on page 6 of the January 15, 2016, biological opinion:

January 15, 2016:	The Service issued the biological opinion for the proposed project (Service file number 08ESMF00-2013-F-0401).
April 20, 2016:	The Service received the protocol-level survey report for the California clapper rail which showed four breeding California clapper rails within the action area in the middle reach of San Francisquito Creek upstream of Friendship Bridge where the Service's biological opinion for the proposed project had anticipated only infrequent foraging and dispersing individual California clapper rails would occur. The Corps sent via electronic mail to the Service the request to reinitiate formal consultation on the proposed project.
April 25, 2016:	The Service participated in a conference call with staff from the SFCJPA, SCVWD, CDFW, and the Refuge to discuss how the finding of the four breeding California clapper rails upstream of Friendship Bridge would affect the proposed project and the construction schedule. The SFCJPA sent via electronic mail to the Service a summary of the changes to the proposed project.

The Service changes the Construction Schedule on page 15 of the January 15, 2016, biological opinion:

From:

Proposed project construction is expected to last two years with work estimated to begin in the spring of 2016. Post-construction monitoring will continue for at least five years.

To:

Proposed project construction is expected to last three years with work estimated to begin in the summer of 2016. Post-construction monitoring will continue for at least five years.

The Service changes California Clapper Rail Measure number 2 in the **Conservation Measures** on page 25 of the January 15, 2016, biological opinion:

From:

2. If work is to be conducted during the California clapper rail's breeding season (February 1 – August 31) within 700 feet of suitable habitat, a permitted biologist will be retained to conduct California clapper rail protocol-level surveys at the proposed project site in appropriate habitat for the California clapper rail. The surveys will be conducted following the Service's June 2015 survey protocol during the appropriate protocol-level survey period (*i.e.*, late January – April) prior to commencement of construction and maintenance activities (http://www.fws.gov/sfbaydelta/documents/June_2015__Final_CCR_protocol.pdf). Proposed project activities occurring within 700 feet of California clapper rail activity centers will occur only between September 1 and January 31 outside of the California clapper rail's breeding season.

To:

2. If work is to be conducted during the California clapper rail's breeding season (February 1 – August 31) within 700 feet of suitable habitat, a permitted biologist will be retained to conduct California clapper rail protocol-level surveys at the proposed project site in appropriate habitat for the California clapper rail. The surveys will be conducted following the Service's June 2015 survey protocol during the appropriate protocol-level survey period (*i.e.*, late January – April) prior to commencement of construction and maintenance activities (http://www.fws.gov/sfbaydelta/documents/June_2015__Final_CCR_protocol.pdf). Proposed project activities occurring within 700 feet of California clapper rail activity centers will occur only between September 1 and January 31 outside of the California clapper rail's breeding season with the following exception: the relocating of a Pacific Gas & Electric Company electrical tower within upland habitat outside of the floodplain may occur during the California clapper rail's breeding season within 650 feet of a California clapper rail activity center (see Figure 1 below).

The Service changes Predator Management Measure number 1(a) in the **Conservation Measures** on page 29 of the January 15, 2016, biological opinion:

From:

a. Financial contributions towards predator management activities. Since predation is believed to represent the greatest threat and in order to provide the maximum benefit possible to the salt marsh harvest mouse and California clapper rail, the SFCJPA will provide funding to augment current predator trapping activities, so that the desired activities in and around Faber and Laumeister Tract marshes are fully funded. The SFCJPA will enter in to a formal agreement with U.S. Department of Agriculture Wildlife Services for the provision of $8,000 per year with a 5 percent annual increase, the first payment to be made within 30 days after a Clean Water Act Section 404 permit is issued for the proposed project, for a total of five years.

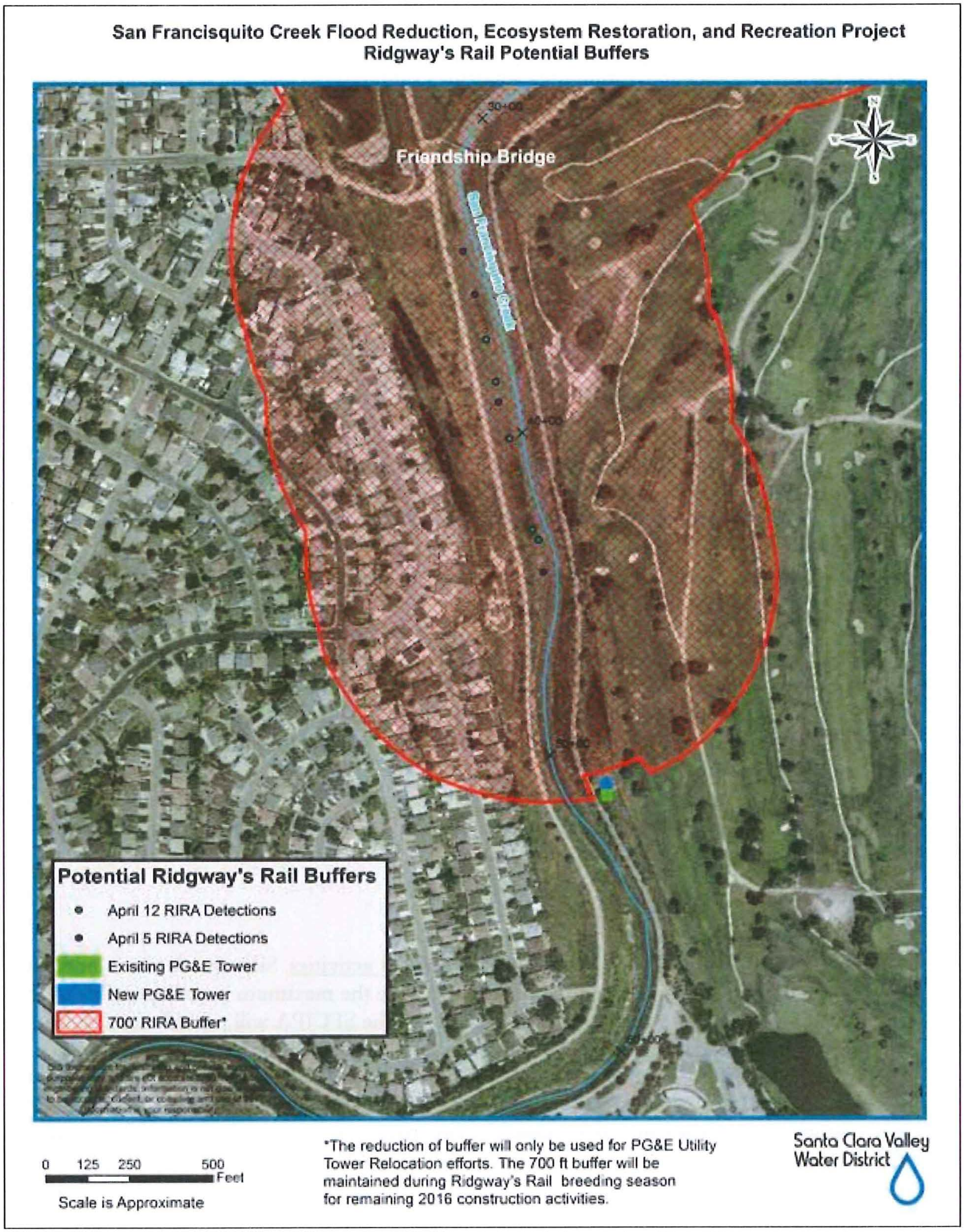

Figure 1. Buffers from California clapper rails in the middle reach of San Francisquito Creek during the breeding season.

To:

a. Financial contributions towards predator management activities. Since predation is believed to represent the greatest threat and in order to provide the maximum benefit possible to the salt marsh harvest mouse and California clapper rail, the SFCJPA will provide funding to augment current predator trapping activities, so that the desired activities in and around Faber and Laumeister Tract marshes are fully funded. The SFCJPA will enter in to a formal agreement with U.S. Department of Agriculture Wildlife Services for the provision of $8,000 per year with a 5 percent annual increase, the first payment to be made within 30 days after a Clean Water Act Section 404 permit is issued for the proposed project, for a total of six years.

The Service adds to the **Environmental Baseline** section for the California clapper rail on page 50 of the January 15, 2016, biological opinion:

Protocol-level surveys for the California clapper rail detected four breeding California clapper rails within the middle reach of San Francisquito Creek upstream of Friendship Bridge during two survey dates in April 2016. Therefore, the Service believes that California clapper rails are likely to breed within the middle reach of San Francisquito Creek upstream of Friendship Bridge.

The Service adds to the **Effects of the Proposed Project** section for the California clapper rail on page 56 of the January 15, 2016, biological opinion:

The proposed project will result in the temporary disturbance of about 2.07 acres and the permanent loss of about 0.46 acre of occupied tidal marsh breeding habitat for the California clapper rail in the middle reach of San Francisquito Creek upstream of Friendship Bridge. Thus in total about 2.92 acres of tidal marsh breeding habitat for the California clapper rail will be temporarily disturbed and about 0.52 acre of tidal marsh breeding habitat will be permanently lost within the action area along the lower and middle reaches of San Francisquito Creek (Table 3). Therefore, in summary the proposed project will result in the temporary disturbance of about 3.83 acres and the permanent loss of about 0.82 acre of tidal marsh habitat for California clapper rail during the construction of the proposed project (*i.e.*, construction of the San Francisquito Creek levees and widened channel, filling in low spots in the Main Faber Marsh levee, and accessing and degrading the Bay levee). The widening of the San Francisquito Creek channel will result in a net increase of about 6.90 acres of tidal marsh breeding habitat for the California clapper rail within the action area along the San Francisquito Creek channel (Table 4). The tidal marsh habitat within the widened San Francisquito Creek channel will be monitored and revegetated under a Service-approved five-year Mitigation and Monitoring Plan.

The Service replaces Table 3 on page 52 of the **Effects of the Proposed Project** section of the January 15, 2016, biological opinion with the following:

Table 3. Habitat loss and disturbance.

Habitat Type	Temporary Disturbance		Permanent Loss	
	Acres	Linear Feet[1]	Acres	Linear Feet[1]
Salt Marsh Harvest Mouse Only				
Diked Marsh	1.89	n/a	0.79	n/a
Ruderal Grassland				
Construction	13.05	n/a	1.28	n/a
Ongoing O&M (levee mowing)[2]	0.00	n/a	6.49	n/a
Salt Marsh Harvest Mouse Only Subtotal	**14.94**	n/a	**8.56**	n/a
Salt Marsh Harvest Mouse and California Clapper Rail				
Tidal Salt Marsh				
Main Faber Marsh Southern Levee	0.32	475	0.30	598
Bay Levee	0.40	636	0.00	0
Bay Levee access	0.00	0	0.00	0
Outer Faber High-Tide Refugia Islands[3]	0.19	n/a	0.00	n/a
All other construction (creek channel)	2.92	n/a	0.52	n/a
Tidal Salt Marsh Subtotal	3.83	n/a	0.82	n/a
Upland Refugia/Transition Zone				
Main Faber Marsh Southern Levee[4]	1.03	1,018	0.27	488
Transition Zone Habitat Enhancement[4]	5.66	5,120	0.00	n/a
Bay Levee	0.93	651	0.00	0
Bay Levee access[4]	0.44	1,150	0.00	0
All other construction (creek channel)	0.06	n/a	0.00	n/a
Upland Refugia/Transition Zone Subtotal	8.12	n/a	0.27	n/a
Salt Marsh Harvest Mouse and California Clapper Rail Subtotal	**11.95**	n/a	**1.09**	n/a
GRAND TOTAL	**26.89**	n/a	**9.65**	n/a

[1] Linear footage of disturbance is only reported for effects incurred from construction of the Main Faber Marsh levee, Bay levee lowering, access, and levee habitat enhancement along the Main Faber Marsh and Outer Faber Marsh levees (n/a = not applicable).

[2] Ongoing O&M effects from annual mowing of grassland habitat along the levees is counted as a permanent effect. However, salt marsh harvest mouse forage and dispersal habitat will be present, especially seasonally between mowing events, when vegetation is taller.

[3] High-tide refuge islands will likely establish as jurisdictional wetlands (*i.e.*, tidal marsh) with wetland plant palette and saturated subsoils. The 0.19 acre of marsh disturbance will be temporary.

[4] A total of about 5,120 linear feet of habitat will be disturbed during transition zone enhancement along the northern, eastern, and southern Main Faber Marsh levees including 1,540 linear feet of the southern levee which partially overlaps with the 1,018 linear feet of disturbance from construction along the southern levee. However, the 5.66-acre estimate for transition zone enhancement does not include the impacts from construction activities along the southern levee.

The Service replaces Table 4 on page 53 of the **Effects of the Proposed Project** section of the January 15, 2016, biological opinion with the following:

Table 4. Post-construction changes in the areal extent of suitable habitat within the action area.

Habitat Type	Post-Construction Surface Area (acres)	Net Gain or Loss (acres)	Habitat Enhanced[2] (acres)
California Clapper Rail and Salt Marsh Harvest Mouse			
Tidal Marsh[1]	11.41	+6.90	n/a
Upland Refugia/Transition Zone[2]	7.83	+1.64	5.66[2]
Salt Marsh Harvest Mouse Only			
Diked Marsh	1.06	-1.61	n/a
Upland Foraging/Dispersal[3] (Ruderal Grassland)	14.70	-6.12[3]	n/a

[1] Tidal marsh along the lower reach of San Francisquito Creek downstream of Friendship Bridge and along the middle reach of San Francisquito Creek between Friendship Bridge and the ends of Geng Road and Daphne Way is counted as suitable habitat for both California clapper rail and salt marsh harvest mouse. Tidal marsh along the upper reach of San Francisquito Creek upstream of the ends of Geng Road and Daphne Way are not counted as suitable habitat for the California clapper rail or salt marsh harvest mouse.

[2] The enhancement of 5.66 acres of upland refugia/transition zone habitat along the southern, northern, and eastern levees of Main Faber Marsh and the western levee of Outer Faber Marsh through invasive plant control and planting suitable native transition zone plant species (n/a = not applicable).

[3] The ongoing disturbance of 6.49 acres of grassland habitat from annual levee mowing is counted as a net loss of habitat; however, the grassland will be available as salt marsh harvest mouse foraging and dispersal habitat in between mowing events, especially during the wet season. Some potential upland foraging/dispersal habitat would be created on the new levee on the Palo Alto side due to the increase in surface area of the levee on the Palo Alto side post-construction.

The Service changes the **Amount or Extent of Take** of the California clapper rail on pages 65 and 66 of the January 15, 2016, biological opinion:

From:

1. The harassment and non-lethal harm of all California clapper rails within the 1.57 acres of suitable tidal marsh habitat and 2.46 acres of suitable upland refugia/transition zone habitat temporarily disturbed during the construction of the proposed project (*i.e.*, construction of the San Francisquito Creek levees and widened channel, filling in low spots in the Main Faber Marsh levee, and accessing and degrading the Bay levee).

2. The harassment and non-lethal harm of all California clapper rails within the 0.36 acre of suitable tidal marsh habitat and 0.27 acre of suitable upland refugia/transition zone habitat permanently lost during the construction of the proposed project (*i.e.*, construction of the San Francisquito Creek levees and widened channel, filling in low spots in the Main Faber Marsh levee, and accessing and degrading the Bay levee).

To:

1. The harassment and non-lethal harm of all California clapper rails within the 3.83 acres of suitable tidal marsh habitat and 2.46 acres of suitable upland refugia/transition zone habitat temporarily disturbed during the construction of the proposed project (*i.e.*, construction of the San Francisquito Creek levees and widened channel, filling in low spots in the Main Faber Marsh levee, and accessing and degrading the Bay levee).

2. The harassment and non-lethal harm of all California clapper rails within the 0.82 acre of suitable tidal marsh habitat and 0.27 acre of suitable upland refugia/transition zone habitat permanently lost during the construction of the proposed project (*i.e.*, construction of the San Francisquito Creek levees and widened channel, filling in low spots in the Main Faber Marsh levee, and accessing and degrading the Bay levee).

Conclusion

The above changes to the biological opinion for the proposed San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project do not change the Service's conclusion that the proposed San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, as proposed, is not likely to jeopardize the continued existence of the salt marsh harvest mouse because there would be no change in the effects to the salt marsh harvest mouse.

The above changes to the biological opinion for the proposed San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project do not change the Service's conclusion that the proposed San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, as proposed, is not likely to jeopardize the continued existence of the California clapper rail because: (1) no breeding California clapper rails will be disturbed due to the maintenance of buffers from California clapper rails during the breeding season; (2) although the proposed project will temporarily disturb about 3.83 acres and permanently remove about 0.82 acre of suitable tidal marsh breeding habitat for California clapper rail, the widening of the San Francisquito Creek channel will result in a net increase of about 6.90 acres of suitable tidal marsh breeding habitat for California clapper rail within the action area along the San Francisquito Creek channel; and (3) the tidal marsh habitat within the widened San Francisquito Creek channel will be revegetated and monitored under a Service-approved Mitigation and Monitoring Plan.

This concludes formal consultation on the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (a) if the amount or extent of taking specified in the incidental take statement is exceeded; (b) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (c) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or (d) if a new species is listed or critical habitat designated that may be affected by the identified action.

If you have questions concerning this reinitiation of the biological opinion for the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project in San Mateo and Santa Clara Counties, California, please contact Joseph Terry, Senior Biologist, or Ryan Olah, Coast/Bay Division Chief, at the letterhead address, at telephone number (916) 414-6623, or email (joseph_terry@fws.gov) or (ryan_olah@fws.gov.)

Sincerely,

Jennifer M. Norris
Field Supervisor

cc:
Anne Morkill, San Francisco Bay National Wildlife Refuge Complex, Fremont, California
Kim Squires, Bay/Delta Fish and Wildlife Office, Sacramento, California
Tami Schane, California Department of Fish and Wildlife, Napa, California
Susan Glendening, San Francisco Bay Regional Water Quality Control Board, Oakland, California
Len Materman, San Francisquito Creek Joint Powers Authority, Menlo Park, California
Amanda Morrison, National Oceanic and Atmospheric Administration/National Marine Fisheries Service, Santa Rosa, California
Brenda Goeden, San Francisco Bay Conservation and Development Commission, San Francisco, California

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Suite W-2605
Sacramento, California 95825-1846

In Reply Refer to:
08ESMF00-
2013-F-0401

JAN 15 2016

Ms. Tori White
Attn: Greg Brown
Department of the Army
San Francisco District, U.S. Army Corps of Engineers
1455 Market Street
San Francisco, California 94103-1398

Subject: Formal Consultation on the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, from San Francisco Bay to Highway 101, in the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California (U.S. Army Corps of Engineers (Corps) file number 2013-00030S)

Dear Ms. White:

This letter is in response to the Corps' April 25, 2013, request for initiation of consultation for the San Francisquito Creek Joint Powers Authority's (SFCJPA) proposed San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project (proposed project), from San Francisco Bay to Highway 101, in the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California (Corps file number 2013-00030S). Your request for consultation was received in our office on April 29, 2013. At issue are the proposed project's effects on the federally threatened California red-legged frog (*Rana draytonii*), endangered San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), threatened Pacific Coast population of the western snowy plover (western snowy plover) (*Charadrius alexandrinus nivosus*), endangered California clapper rail (*Rallus longirostris obsoletus*), endangered salt marsh harvest mouse (*Reithrodontomys raviventris*), endangered California least tern (*Sternula antillarum browni*), and endangered California seablite (*Suaeda californica*). Critical habitat has been designated for the California red-legged frog and western snowy plover but does not occur within the action area for the proposed project. This response is provided under the authority of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*) (Act), and in accordance with the implementing regulations pertaining to interagency cooperation (50 CFR 402).

Recent genetic analyses of rail species resulted in a change in the common name and taxonomy of the large, "clapper-type" rails (*Rallus longirostris*) of the west coast of North America to Ridgway's rail (*Rallus obsoletus*) (Maley and Brumfield 2013, Chesser *et al.* 2014). Thus the California clapper rail is now referred to in the scientific community as the California Ridgway's rail (*Rallus obsoletus obsoletus*). The change in the common name and taxonomy of the California clapper rail, however, does not change the listing status of the species.

The Federal action we are consulting on is the Corps' issuance of a permit to SFCJPA pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C Section 403) and Section 404 of the

Clean Water Act of 1973 (33 U.S.C. Section 1344) to reduce flooding risks and increase ecosystem functionality by widening the floodplain of San Francisquito Creek through levee de-construction and construction of floodwalls, degrading the Bay levee between Outer Faber Marsh and the creek's mouth, filling in low spots in portions of the unmaintained Faber Tract (Main Faber Marsh) southern levee, and sediment excavation of the creek channel. Pursuant to 50 CFR 402.12(j), you submitted a biological assessment for our review and requested concurrence with the findings presented therein. These findings conclude that the proposed project may affect, and is likely to adversely affect the salt marsh harvest mouse and California clapper rail. These findings conclude that the proposed project may affect, but is not likely to adversely affect the California red-legged frog, San Francisco garter snake, western snowy plover, California least tern, and California seablite.

In considering your request, we based our evaluation on the following: (1) your letter requesting consultation on the proposed project dated April 25, 2013; (2) the November 2012 *Draft Biological and Essential Fish Habitat Assessment for the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project San Francisco Bay to Highway 101* (ICF International 2012); (3) the January 17, 2013 letter from ICF International responding to the Service's July 3, 2013, request for additional information (M. Jones, ICF International, *in litt.* 2013); (4) the August 27, 2014, *Amended Biological Assessment for the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, from San Francisco Bay to Highway 101 in the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California* (L. Materman, SFCJPA, *in litt.* 2014); (5) the December 2015 *San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Mitigation and Monitoring Plan* (MMP) (SCVWD 2015); (6) protocol-level surveys for the California clapper rail (PRBO Conservation Science 2012; Point Blue Conservation Science 2014; Point Blue Conservation Science, *in litt.* 2014); (7) the March 5, 2015, memorandum from the Santa Clara Valley Water District (SCVWD) summarizing listed species habitat impacts (SCVWD, *in litt.* 2015); (8) the July 24, 2015, September 9, 2015, October 5, 2015, and October 26, 2015, memoranda from SFCJPA responding to the Service's requests for additional information (K. Murray, SFCJPA, *in litt.* 2015a, 2015b, 2015c, 2015d, 2015e); (9) the October 6, 2015, *San Francisquito Creek Flood Protection Project: Conceptual High-Tide Refuge Habitat Enhancement Plan* (H.T. Harvey & Associates 2015a); (10) electronic mail and conversations among the SFCJPA, ICF International, SCVWD, the Corps, California Department of Fish and Wildlife (CDFW), the San Francisco Bay Regional Water Quality Control Board (SFRWQCB), Don Edwards San Francisco Bay National Wildlife Refuge (Refuge), National Oceanic and Atmospheric Administration/National Marine Fisheries Service (NMFS), the City of Palo Alto, the City of East Palo Alto, Bay Conservation and Development Commission (BCDC), H.T Harvey & Associates, U.S. Geological Survey, and the Service; (11) site visits conducted on February 28, 2013, April 16, 2013, and October 22, 2014; and (12) other information available to the Service.

The Service has determined that the proposed project is not likely to adversely affect the California red-legged frog and San Francisco garter snake because: (1) the portion of San Francisquito Creek within the action area is predominately tidally influenced and thus less suitable for the California red-legged frog and San Francisco garter snake; (2) the nearest known occurrences of the California red-legged frog and San Francisco garter snake are more than five miles upstream from the action area; (3) the potential for injuring or killing a California red-legged frog and San Francisco garter snake will be minimized by having a qualified biologist onsite during project construction; (4) all proposed project construction staff will be trained in identifying the California red-legged frog and San Francisco garter snake and their habitats and the avoidance and minimization measures; and (5) the potential for degrading aquatic habitat for the California red-legged frog and San Francisco garter snake will be minimized by implementing water quality best management practices, a Storm Water Pollution Prevention Plan, and a hazardous material/spill prevention plan.

The Service has determined that the proposed project is not likely to adversely affect the western snowy plover and California least tern because: (1) the western snowy plover and California least tern are not known to breed within the action area; (2) the potential for injuring or killing a western snowy plover and California least tern will be minimized by having a qualified biologist onsite during project construction; (4) all proposed project construction staff will be trained in identifying the western snowy plover and California least tern; and (5) the potential for degrading foraging habitat for the western snowy plover and California least tern will be minimized by implementing water quality best management practices, a Storm Water Pollution Prevention Plan, and a hazardous material/spill prevention plan.

The Service has determined that the proposed project is not likely to adversely affect the California seablite because: (1) the listed plant is thought to have been extirpated from the action area; and (2) the California seablite was not seen during protocol-level surveys within the action area in August 2013.

The remainder of this document provides our biological opinion on the effects of the proposed project on the salt marsh harvest mouse and California clapper rail.

CONSULTATION HISTORY

October 24, 2012:	The Service participated in a conference call among staff from the Refuge, SFCJPA, and ICF International discussing the proposed project.
February 28, 2013:	The Service attended a site visit along with staff from SFCJPA, ICF International, SCVWD, CDFW, and SFRWQCB.
April, 16, 2013:	The Service attended a second site visit along with staff from SFCJPA, ICF International, and the Refuge.
April 29, 2013:	The Service received from the Corps the Biological Assessment (ICF International 2012) and the request for consultation on the proposed project.
July 3, 2013:	The Service sent a letter to the Corps commenting on the Biological Assessment and requesting additional information on the proposed project. The letter mentioned the Service's major concerns regarding the loss of high tide refugia habitat and increased flooding of tidal marsh habitat for the salt marsh harvest mouse and California clapper rail within Faber Marsh if the levee between San Francisquito Creek and Main Faber Marsh were degraded.
September – December 2013:	The Service attended multiple interagency meetings among staff from SFCJPA, ICF International, SCVWD, CDFW, SFRWQCB,

BCDC, NMFS, and the Refuge discussing the Service's concerns about the effects of the proposed project on the large population of California clapper rails within Faber Marsh due to the proposed lowering of the levee along the southern edge of Main Faber Marsh. At the December 12, 2013, meeting, ICF International and SFCJPA proposed revising the proposed project to avoid lowering the levee along Main Faber Marsh.

January 23, 2014:	The Service received the letter from ICF International responding to the Service's July 3, 2013, request for additional information on the proposed project.
February – July 2014:	The Service attended multiple interagency meetings for the proposed project among staff from the Refuge, the Corps, SCVWD, SFCJPA, CDFW, SFRWQCB, NMFS, and BCDC discussing the various alternatives for the proposed project including filling in low spots in the Main Faber Marsh levee, degrading the Bay levee adjacent to Outer Faber Marsh near the mouth of San Francisquito Creek, and further setting back the levee into the Palo Alto Municipal Golf Course.
August 28, 2014:	The Service received the amended Biological Assessment from the Corps and SFCJPA for the proposed project (L. Materman, SFCJPA, *in litt.* 2014).
September 3, 2014:	The Service responded via electronic email to the Corps and SFCJPA that the proposed project should include additional avoidance and minimization measures to address predation on salt marsh harvest mice and California clapper rails and the loss of high tide refugia cover (*e.g.*, avian and mammalian predator management, transition zone habitat enhancement, and installation of high-tide refuge islands in Faber Marsh).
October 20, 2014:	The Service submitted via electronic mail to SFCJPA and the Corps comments on the draft MMP (SCVWD 2014) and the Draft Operations and Maintenance (O&M) Plan (SFCJPA 2014) for the proposed project.
October 22, 2014:	The Service attended a site visit with staff from SFCJPA, the Refuge, CDFW, SFRWQCB, and U.S. Geological Survey to discuss measures to enhance habitat for salt marsh harvest mice and California clapper rails and minimize the levels of predation within Faber Marsh.
December 2, 2014:	The Service sent a letter to the Corps and SFCJPA commenting on the August 2014 amended Biological Assessment (L. Materman, SFCJPA, *in litt.* 2014), the draft MMP (SCVWD

	2014), and the Draft O&M Plan (SFCJPA 2014) and requesting additional information on the proposed project.
April 15, 2015:	The Service received from SFCJPA and SCVWD the revised estimates of habitat disturbance (SCVWD *in litt.* 2015).
April 29, 2015:	The Service attended a meeting with staff from SFCJPA, the Corps, CDFW, and the Refuge to discuss avoidance and minimization measures.
July - December 2015:	The Service participated in biweekly conference calls with staff from SFCJPA, the Corps, the Refuge, NMFS, CDFW, and SCVWD to discuss the information needed to initiate formal consultation.
July 24, 2015:	The Service received via electronic mail from SFCJPA the memoranda responding to the Service's December 2, 2014, request for information on the proposed project (K. Murray, SFCJPA, *in litt.* 2015a, 2015b).
July 27, 2015:	The Service provided via electronic mail to SFCJPA and the Corps comments on the July 24, 2015, memoranda from SFCJPA.
August 20, 2015:	The Service attended a meeting with staff from H.T. Harvey & Associates, the Refuge, SFCJPA, CDFW, and the U.S. Geological Survey to discuss the restoration actions for the proposed project (*e.g.*, permanent high-tide refuge islands in Outer Faber Marsh, transition zone habitat enhancement along the Faber Marsh levees, invasive plant species control).
September 9, 2015:	The Service received via electronic mail from SFCJPA (K. Murray, SFCJPA, *in litt.* 2015c) the responses to the Service's comments on the July 24, 2015, memoranda from SFCJPA (*e.g.*, revised estimates of habitat disturbance and restoration; the predator management plan; the draft MMP; the revised Draft O&M Plan (SFCJPA 2015); the description of the proposed levee mowing activities for O&M; and the draft proposal for installation of high-tide refuge islands in Outer Faber Marsh).
September 15 and 24, 2015:	The Service provided via electronic mail to SFCJPA and the Corps comments on and requests for clarification of the information provided by SFCJPA on September 9, 2015 (*e.g.*, clarification of California clapper rail habitat disturbance estimates and habitat restoration/creation estimates within the widened San Francisquito Creek channel; clarification of proposed project levee mowing O&M activities; and a request for

	information on the cumulative effects of other levee mowing O&M activities within the action area).
October 5, 2015:	The Service received via electronic mail from SFCJPA the responses to the Service's September 15 and 24, 2015, comments and request for clarification.
October 7, 2015:	The Service received via electronic mail from SFCJPA the *San Francisquito Creek Flood Protection Project: Conceptual High-Tide Refuge Habitat Enhancement Plan* (H.T. Harvey & Associates 2015a).
October 26, 2015:	The Service received via electronic mail from SFCJPA (K. Murray, SFCJPA, *in litt.* 2015e) responses to the Service's October 19, 2015, comments on the information provided by SFCJPA on October 5 and 7, 2015 (K. Murray, SFCJPA, *in litt.* 2015d; H.T. Harvey & Associates 2015a).
November 18, 2015:	The Service, the Refuge, and U.S. Geological Survey provided via electronic mail to SFCJPA, the Corps, SCVWD, NMFS, CDFW, H.T. Harvey & Associates, and SFRWQCB comments on the *San Francisquito Creek Flood Protection Project: Conceptual High-Tide Refuge Habitat Enhancement Plan* (H.T. Harvey & Associates 2015a).
December 3, 2015:	The Service received from SFCJPA the draft plan for the installation of steelhead passage features within the proposed project footprint in San Francisquito Creek.
December 17, 2015:	The Service received from SFCJPA the final project description and the revised MMP for proposed project revegetation and monitoring activities (SCVWD 2015).

BIOLOGICAL OPINION

<u>Description of the Proposed Project</u>

Location of the Proposed Project

The San Francisquito Creek watershed encompasses a 45-square-mile basin, extending from Skyline Boulevard to San Francisco Bay. San Francisquito Creek represents the boundary between San Mateo and Santa Clara counties, California, in the lower watershed. Figure 1 below shows the location of the proposed project. The proposed project area as a whole extends about 7,450 feet along San Francisquito Creek from San Francisco Bay upstream to the U.S. Highway 101/East Bayshore Road Bridge. The right bank refers to the San Mateo County (City of East Palo Alto) side of San Francisquito Creek, and the left bank refers to the Santa Clara County (City of Palo Alto) side of San Francisquito Creek. The lower reach of the proposed project extends about 2,850 feet from San Francisco Bay upstream to the Friendship Bridge; the tidal marshes of the Refuge-managed Main Faber Marsh and Outer Faber Marsh (the triangular-shaped tidal marsh downstream (east) of Main Faber Marsh) occur on the right bank, and the Palo Alto Municipal Golf Course and Palo Alto

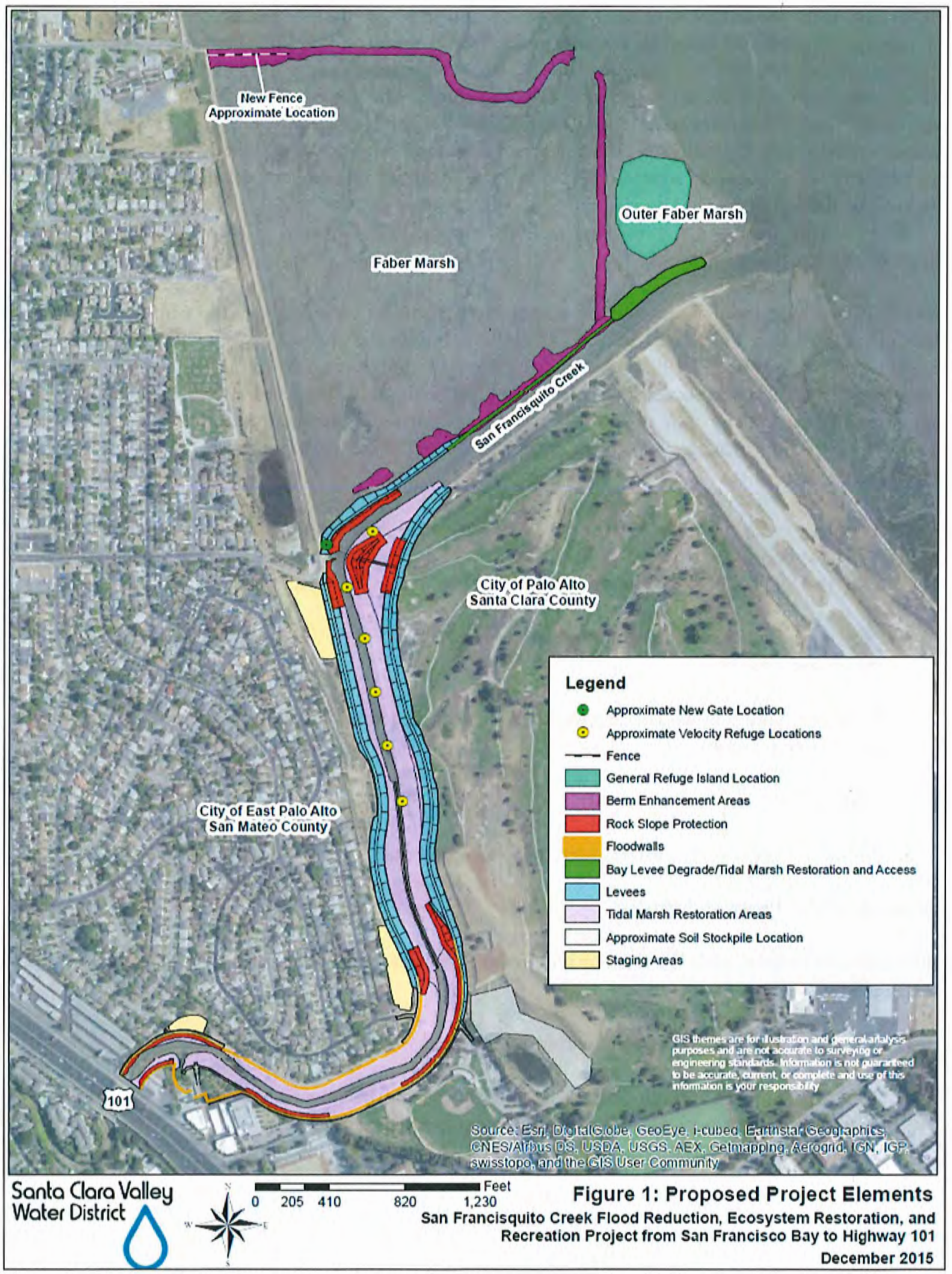

Figure 1. Action area and proposed project elements.

Airport occur on the left bank of the lower reach. The middle reach of the proposed project extends about 2,600 feet from the Friendship Bridge upstream to Daphne Way; a residential neighborhood of the City of East Palo Alto occurs on the right bank, and the Palo Alto Municipal Golf Course occurs on the left bank of the middle reach. The upper reach of the proposed project extends about 2,000 feet upstream from Daphne Way to the U.S. Highway 101/East Bayshore Road Bridge; a residential neighborhood of the City of East Palo Alto occurs on the right bank, and a baseball field, an elementary school, and commercial, Federal, and municipal buildings occur on the left bank of the upper reach.

Goals of the Proposed Project

The SFCJPA is a regional government agency whose members include the Cities of Palo Alto, Menlo Park, and East Palo Alto; the San Mateo County Flood Control District, and the SCVWD. The SFCJPA was formed in 1999 following the flood of 1998 to implement flood management, ecosystem restoration and recreational enhancements throughout the San Francisquito Creek watershed and floodplain. The proposed project's goals are to improve flood protection, habitat, and recreational opportunities within the proposed project reach with the following specific objectives:

1. Protect properties and infrastructure between San Francisco Bay and Highway 101 from a 100-year San Francisquito Creek fluvial flood flow occurring at the same time as a 10-year extreme high tide that includes projected sea level rise through 2065;

2. Accommodate future flood protection measures that might be constructed upstream of the proposed project;

3. Enhance habitat along the proposed project reach, particularly habitat for threatened and endangered species;

4. Enhance recreational uses; and

5. Minimize operational and maintenance requirements.

Elements of the Proposed Project

Increasing San Francisquito Creek's capacity from San Francisco Bay to East Bayshore Road would be achieved by:

1. Excavating sediment deposits within the channel to maximize conveyance;

2. Rebuilding levees and relocating a portion of the southern levee to widen the channel to reduce influence of tides and increase channel capacity; and

3. Constructing floodwalls in the upper reach to increase capacity and maintain consistency with the California Department of Transportation's (Caltrans) enlargement of the U.S. Highway 101/East Bayshore Road Bridge over San Francisquito Creek (Caltrans facility).

Major proposed project elements include:

1. Levee setback and improvements to widen the channel and increase levee height and stability between the City of East Palo Alto and the Palo Alto Municipal Golf Course;

2. Floodwalls in the upper reach downstream of East Bayshore Road;

3. Extension of Friendship Bridge via a boardwalk across new marshland within the widened channel;

4. Improving the stability of the Main Faber Marsh levee;

5. Degrading the Bay levee (levee on the right (north) bank of San Francisquito Creek along the southern edge Outer Faber Marsh near the creek's mouth); and

6. Rock-slope protection.

The majority of the proposed project elements would occur on properties in the cities of Palo Alto and East Palo Alto and owned by the City of Palo Alto or within SCVWD or City of East Palo Alto rights-of-way. The project elements proposed to improve management of flood flows along San Francisquito Creek from East Bayshore Road to San Francisco Bay include reconfiguring levees, creating a marsh plain terrace to convey high flows, installing floodwalls, widening of the creek channel, and constructing access roads for maintenance purposes. Proposed project levee and flood wall construction elements are summarized below in Table 1. Marshplain restoration elements are summarized in Table 2. A detailed overview of each project component is provided in the sections that follow.

The proposed project includes:

1. <u>Excavation</u>. Excavating about 106,000 cubic yards of sediment deposits within the channel to maximize conveyance including about 29,800 cubic yards of stripping, 18,700 cubic yards of rubble mound excavation, 11,600 cubic yards of off-haul material, and 46,600 cubic yards of material re-used from excavation.

2. <u>Fill</u>. Total fill of about 185,300 cubic yards consisting of about 46,600 cubic yards of material re-used from excavation and importing about 138,700 cubic yards from Stevens Creek Quarry.

3. <u>Rebuilding and Setting Back Levees</u>. Rebuilding levees and setting back a portion of the levee adjacent to the Palo Alto Municipal Golf Course by 50-100 feet to widen the channel, increase levee height and stability, reduce influence of tides, increase channel capacity, and restore tidal marsh along San Francisquito Creek.

4. <u>Floodwalls</u>. Constructing floodwalls in the upper reach downstream of East Bayshore Road to increase capacity.

Table 1. Summary of proposed levee and floodwall construction elements.

Project Component	**Description**
Levee and floodwall construction	
Levee raising on right bank	From the O'Connor Pump Station tie-in near Friendship Bridge to the floodwall.
Floodwall on right bank	The right floodwall would extend from just downstream of Daphne Way to the end of the project reach where it would connect with the Caltrans U.S. Highway 101/East Bayshore Road facility (Caltrans facility).
Levee raising on left bank and levee relocation	Levee relocation of the middle reach and a small portion of the upper and lower reaches. The levee would be relocated inland (currently occupied by the Golf Course), creating space on the left bank for a marshplain terrace. Except for a section around the eastern footings of Friendship Bridge, the existing levee along this stretch would be removed.
Floodwall on left bank	The left floodwall would extend from the end of the left levee, along the streambed, around the Palo Alto Pump Station, to the end of the project reach where it would connect with the Caltrans facility.
Downstream access road on right bank	The right bank downstream access road would be approximately 16 feet wide and extend from the crown of the right levee to street level to just downstream of Daphne Way.
Upstream access road on right bank	The right bank upstream access road would be approximately 12 feet wide and would extend from just downstream of Verbena Drive to the Caltrans facility at East Bayshore Road.
Access road on left bank	The left bank access road would be generally 12 feet wide and would extend from a point downstream of the International School of the Peninsula to the Palo Alto Pump Station. The access road would also be used as a public trail within the City of Palo Alto and would connect to the Baylands Athletic Center.
Friendship Bridge	The existing Friendship Bridge would be retained and extended as a boardwalk from the retained eastern footing across the new marshplain terrace to the relocated left bank levee.
Stabilize Main Faber Marsh levee	Fill in a low spot along about 400 feet of the Main Faber Marsh levee by raising the lowest levee crest elevation downstream of Friendship Bridge from a minimum elevation of 11 feet to 13 feet, and incorporating a 6H:1V (horizontal : vertical) levee side slope into Main Faber Marsh.
Degrade Bay levee	Removing about 600 feet of the existing right bank levee (STA 3+50 to 9+50) along Outer Faber Marsh near the mouth of San Francisquito Creek.
Rock slope protection	Installation of about 3.71 acres of rock-slope levee protection.

Table 2. Summary of proposed marshplain restoration elements.

Marshplain restoration	
Downstream of Friendship Bridge on right bank	High-marsh and transitional vegetation will be planted from the edge of the San Francisquito Creek channel to the toe of the levee from just upstream of San Francisco Bay to just downstream of Friendship Bridge.
Upstream of Friendship Bridge on right bank	High-marsh and transitional vegetation will be planted from the edge of the San Francisquito Creek channel to the toe of the levee from just upstream of Friendship Bridge to East Bayshore Road.
Left bank	High-marsh and transitional vegetation will be planted from the edge of the San Francisquito Creek channel to the base of the floodwall or the toe of the levee. In this area the marsh will be planted adjacent to the toe of the cut-and-fill area. The marsh will extend from the point at which the new levee would diverge inland from the existing levee to East Bayshore Road.

5. Overflow Terrace and Tidal Marsh Creation. Creating/restoring a total of about 15.14 acres of riparian, tidal marsh, and transition zone habitat along San Francisquito Creek and revegetating with native high marsh plantings, high marsh/transition zone plantings, and high marsh/ transition zone seed mix. This will create an overflow terrace at marsh elevation upstream and adjacent to Main Faber Marsh.

6. Extension of Friendship Bridge. Extension of the Friendship Bridge via a boardwalk across new marshland within the widened channel.

7. Relocating Utilities. Relocation of Pacific Gas and Electric Company (PG&E) electricity transmission lines and towers and gas transmission lines and the East Palo Alto Sanitary District sewer main.

8. Rodent Control. Controlling burrowing rodents on flood control levees within the proposed project area by use of rodenticides in areas outside of known and potential habitat for the salt marsh harvest mouse and California clapper rail. Only live trapping would be used to control burrowing rodents in areas near suitable habitat for the salt marsh harvest mouse and California clapper rail. The live traps will have openings measuring no smaller than two inches by one inch to allow any salt marsh harvest mouse that inadvertently enters the trap to easily escape. All traps will be placed outside of pickleweed areas and above the high tide line.

9. Stabilize Main Faber Marsh Levee. Add fill to the levee separating San Francisquito Creek from Main Faber Marsh in order to reduce concerns regarding levee erosion and the potential for substantial levee failure. Raising the lowest levee crest elevation downstream of Friendship Bridge from a minimum elevation of 11 feet to 13 feet and incorporating a 6 horizontal (H):1 vertical (V) levee side slope into Main Faber Marsh. The 6H:1V levee side slope will help protect the levee toe from erosion due to flow overtopping over a 400-foot distance as the levee transitions upstream to a higher elevation (as part of the Original Application) closer to the

bridge. About 0.30 acre of tidal marsh within Main Faber Marsh will be permanently lost with the installation of the wider levee toe slope. The stabilized levee will be planted with high marsh and transitional vegetation that is consistent with the levee's location adjacent to bayland marsh.

10. Bay Levee Degrade. Downstream of Main Faber Marsh, in a marsh area (Outer Faber Marsh) that is subject to daily tides from San Francisco Bay, a levee separating San Francisquito Creek from San Francisco Bay will be degraded, removing approximately 600 feet of the existing levee (STA 3+50 to 9+50). This will improve the connection between Outer Faber Marsh and San Francisquito Creek and decrease the water surface elevation during large flow events, allowing the channel to expand out over the marsh area at a point further upstream than under existing conditions.

11. Rock-Slope Protection. Installation of about 3.71 acres of rock-slope protection along the San Francisquito Creek channel.

12. Levee Mowing for O&M. SCVWD will mow approximately 6.49 acres of grassland habitat along the San Francisquito Creek levee slopes one to three times per year (see map in Figure 2 for areas that will be mowed by the proposed project). In order to maintain acceptable channel roughness and comply with "Guidelines for . . . Vegetation Management at Levees" and County of Santa Clara Fire Marshal requirements for preventing fire hazards, the SCVWD will mow plants to a height of 3 to 4 inches, one to three times per year. The levees will remain vegetated and plants will grow between mowing cycles. Mowing is rarely necessary or conducted during the wet season, so higher amounts of more suitable habitat will be available during those four to six months. Project O&M may be transferred to the SCVWD Stream Maintenance Program in the future depending on agreements for work in San Mateo County (Service file number 08ESMF00-2012-F-0398, Service 2014).

13. Steelhead Passage Features. SFCJPA will install six velocity refuge features within the proposed project footprint in the San Francisquito Creek channel to improve steelhead passage including five rock and rootwad structures (constructed features including wood logs with and without rootwads and large rocks for anchoring) in the middle reach (upstream of Friendship Bridge) and one rock spur (partial weir) in the lower reach (immediately downstream of Friendship Bridge).

San Francisquito Creek Marshplain Restoration

The proposed project will restore approximately 11.41 acres of tidal marsh/transition zone habitat along San Francisquito Creek, and adjacent areas, in areas that have been identified as potentially supporting salt marsh harvest mouse and/or California clapper rail, effectively restoring tidal influence in the proposed project reach. The proposed marshplain restoration and monitoring is described in more detail in the SCVWD's MMP (SCVWD 2015). Marshplain restoration will span the entire proposed project extent on both banks from East Bayshore Road to San Francisco Bay. Habitat for salt marsh harvest mouse will be restored downstream of a line approximately corresponding to the southwest border of the Palo Alto Golf Course and the end of Geng Road and Daphne Way. Habitat for California clapper rail will be restored downstream of Friendship Bridge. After levee construction is complete, the tidal marsh area will be terraced and revegetated with high-marsh plants appropriate to the elevation relative to tidal levels. The high-marsh planting area will include alkali weed, saltgrass, alkali heath, marsh jaumea, and perennial pickleweed. The high-marsh

Figure 2. San Francisquito Creek proposed areas of levee mowing for O&M (not including existing mowing for the San Francisco Bay Trail) (copied from K. Murray, SFCJPA, *in litt.* 2015c).

transition planting area will include fat hen, alkali weed, saltgrass, alkali heath, gumweed, marsh jaumea, and western marsh rosemary. The high marsh transition seed mix area will include fat hen, marsh baccharis, alkali weed, hybrid wheatgrass, alkali heath, gumweed, salt heliotrope, meadow barley, alkali barley, western marsh rosemary, and pickleweed. Native marsh plants will be used to revegetate the terraced land. Plants appropriate to the high marsh will be planted near the stream channel. Plants native to marsh transition areas will be planted in areas more distant from the creek channel and in the upper half of the proposed project area as elevation gains.

Approximately 19,500 high marsh and high marsh transition wetland plants and cuttings are planned for installation. Plants will be sourced from the San Francisquito Creek watershed and Baylands areas. A temporary irrigation system will be installed for use during the planting and three-year establishment phase, in order to provide a back-up water supply to the newly-installed vegetation in the event of a period of drought during the winter or spring rainy season, and for irrigation as needed during the summer. Irrigation frequency is expected to be reduced as the site develops during the establishment phase.

The successful implementation of the marshplain restoration will mitigate for permanent and temporary impacts to diked marsh, tidal salt marsh habitat, tidal channel and bay waters, and riparian habitat, and enhance the habitat surrounding the lower reach of San Francisquito Creek. To ensure these goals are met, annual monitoring will be conducted over a five-year period. Performance goals will aid in determining if the site is progressing incrementally toward meeting the Year 5 success criteria. Year 5 monitoring will determine if the success criteria have been achieved. Monitoring will be overseen or conducted by a qualified biologist with experience in mitigation monitoring. Final success will not be considered to have been achieved until temporary irrigation has been off for at least two years.

The performance criteria for restoration of the marshplain are:

1. Vegetative cover increases continuously throughout the period monitored for mitigation compliance;

2. Plant species composition consists of native tidal marsh species appropriate to the salinity regime; and

3. Net increase of waters and wetlands as shown in a Corps wetland delineation.

Qualitative monitoring will provide an opportunity to assess general site conditions and year to year trends based on reconnaissance-level field observations and photo-documentation. Qualitative monitoring will occur annually during the same time frame as specified for quantitative monitoring, and occur at low tide to enable the best viewing of the marsh vegetation. Observations will include impressions of overall plant health, apparent differences in conditions within and between planting zones, prevalence or particular locations of invasive weeds, any visible problems or damage to the site and potential causes. Photo-documentation of the site will be conducted annually from at least six fixed locations showing each planting zone and the overall site. Photo points and directions will be selected during the first year of monitoring and documented on a site planting plan. Observations from the qualitative monitoring will be presented in the form of a short narrative paragraph with photographs attached.

The success of the marsh vegetation mitigation will be quantitatively evaluated by measuring the following:

1. Final success criteria consist of achieving at least 13.67 acres of tidal marsh/transition zone habitat with at least 60 percent cover of wetland indicator species by Year 5; and

2. Invasive species shall not exceed a maximum of 5 percent cover.

A formal delineation of the created jurisdictional areas will be undertaken at the site five years following mitigation site construction. The mitigation will be considered a success if the wetland delineation reveals that at least 13.67 acres of tidal salt marsh, 0.80 acre of diked marsh, and 2.32 acres of tidal channel are restored. Percent cover will be used as the primary indicator of successful establishment of wetland habitat. The final goal is 60 percent cover of wetland indicator species by the end of the monitoring period (SCVWD 2014). Invasive species shall not exceed a maximum of 5 percent cover and shall be removed prior to going to seed. Weeds will be removed by hand tools, mechanical equipment, or herbicides that are approved by the U.S. Environmental Protection Agency for use in aquatic environments. Weed management activities will be conducted in accordance with the SCVWD's Stream Maintenance Program's current accepted practices at the time of the control work (Service file number 08ESMF00-2012-F-0398, Service 2014). Under the Stream Maintenance Program, use of herbicides is part of an integrated pest management approach targeting the use of proper tools to reach project objectives. The SFCJPA will be the permit holder and responsible for compliance monitoring.

Construction Schedule

Proposed project construction is expected to last two years with work estimated to begin in the spring of 2016. Post-construction monitoring will continue for at least five years.

Conservation Measures

As part of the proposed project, SFCJPA, SCVWD, and their contractors will implement the following conservation measures to avoid and minimize potential effects on the salt marsh harvest mouse and California clapper rail and their habitats.

General Construction Site Housekeeping

The work site, areas adjacent to the work site, and access roads will be maintained in an orderly condition, free and clear from debris and discarded materials. Personnel will not sweep, grade, or flush surplus materials, rubbish, debris, or dust into storm drains or waterways. Upon completion of work, all building materials, debris, unused materials, concrete forms, and other construction-related materials will be removed from the work site. To prevent mosquito breeding on construction sites, the SFCJPA will require the construction contractor to ensure that surface water is gone within four days (96 hours). All outdoor grounds will be examined and unnecessary water that may stand longer than 96 hours will be drained. Construction personnel will properly dispose of unwanted or unused artificial containers and tires. If possible, any container or object that holds standing water that must remain outdoors will be covered, inverted, or have drainage holes drilled.

The following general construction site housekeeping measures will be implemented as necessary within staging areas.

1. Staging areas that are not already paved or covered with compacted aggregate base, and that are used for parking vehicles, trailers, workshops, maintenance areas, or equipment, piping, formwork, rebar, storing masonry on pallets, and metal product storage, will be graded as required, and surfaced with a minimum of three inches of compacted aggregate base rock over a high modulus, woven, and soil separation geo-textile. Areas storing aggregate base or other rock products will also be placed on this same geo-textile. The objective is to maintain separation between native and construction materials. Areas storing soils and sand are not required to be surfaced with aggregate base course.

2. Aggregate base will be removed from all staging areas prior to proposed project completion, and the surfaces will be re-graded to their original grades or matching surrounding conditions as directed by the Engineer.

3. Any soils contaminated with petroleum product or other hazardous materials by the contractor will be removed by the contractor and disposed of in accordance with local, State, and Federal laws.

4. The contractor is responsible for weed control in staging areas and material storage areas.

The spread of invasive nonnative plant species and plant pathogens will be avoided or minimized by implementing the following measures:

1. Construction equipment will arrive at the proposed project site clean and free of soil, seed, and plant parts to reduce the likelihood of introducing new weed species.

2. Any imported fill material, soil amendments, gravel, etc., required for construction and/or restoration activities that will be placed within the upper 12 inches of the ground surface will be free of vegetation and plant material.

3. Certified weed-free imported erosion control materials (or rice straw in upland areas) will be used exclusively.

4. To reduce the movement of invasive weeds into uninfested areas, the contractor will stockpile topsoil removed during excavation and will subsequently reuse the stockpiled soil for re-establishment of disturbed project areas.

<u>Water Quality Protection</u>

1. The following measures will be implemented as necessary to reduce and minimize storm water pollution during ground disturbing maintenance activities:

    a. Soils exposed due to maintenance activities will be seeded and stabilized using hydroseeding, straw placement, mulching, and/or erosion control fabric. These measures will be implemented such that the site is stabilized and water quality protected prior to significant rainfall.

b. The preference for erosion control fabrics will be to consist of natural fibers. No plastic monofilament or similar material will be used.

c. Appropriate measures include, but are not limited to, the following: silt fences, straw bale barriers, brush or rock filters, storm drain inlet protection, sediment traps, sediment basins, erosion control blankets and mats, soil stabilization (*i.e.* tackified straw with seed, jute or geotextile blankets, etc.), wood chips, and straw mulch.

2. All temporary construction-related erosion control methods will be removed at the completion of the proposed project (*e.g.*, silt fences).

3. Sediments will be stored and transported in a manner that minimizes water quality effects.

   a. Wet sediments may be stockpiled outside of a live stream or may be stockpiled within a dewatered stream so water can drain or evaporate before removal.

   b. This measure applies to saturated, not damp, sediments and depends on the availability of a stockpile site.

   c. For those stockpiles located outside the channel, water draining from them will not be allowed to flow back into the creek or into local storm drains that enter the creek, unless water quality protection measures recommended by SFRWQCB are implemented.

   d. Trucks may be lined with an impervious material (*e.g.*, plastic), or the tailgate blocked with dry dirt or hay bales, for example, or trucks may drain excess water by slightly tilting their loads and allowing the water to drain out.

   e. Water will not drain directly into channels (outside of the work area) or onto public streets without providing water quality control measures.

   f. Streets and affected public parking lots will be cleared of mud and/or dirt by street sweeping (with a vacuum-powered street sweeper), as necessary, and not by hosing down the street.

4. Oily, greasy, or sediment-laden substances or other material that originate from the proposed project operations and may degrade the quality of surface water or adversely affect aquatic life, fish, or wildlife will not be allowed to enter, or be placed where they may later enter, any waterway.

5. The proposed project will not increase the turbidity of any watercourse flowing past the construction site by taking all necessary precautions to limit the increase in turbidity as follows.

   a. Where natural turbidity is between 0 and 50 Nephelometric Turbidity Units (NTU), increases will not exceed 5 percent.

   b. Where natural turbidity is greater than 50 NTU, increases will not exceed 10 percent.

c. Where the receiving water body is a dry creek bed or storm drain, waters in excess of 50 NTU will not be discharged from the proposed project.

d. Water turbidity changes will be monitored. The discharge water measurements will be made at the point where the discharge water exits the water control system for tidal sites and 100 feet downstream of the discharge point for non-tidal sites. Natural watercourse turbidity measurements will be made in the receiving water 100 feet upstream of the discharge site. Natural watercourse turbidity measurements will be made prior to initiation of proposed project discharges, preferably at least two days prior to commencement of operations.

6. No washing of vehicles will occur at job sites.

7. No fueling will be done in a waterway or immediate floodplain, unless equipment stationed in these locations cannot be readily relocated (*i.e.*, pumps, generators).

   a. For stationary equipment that must be fueled on the site, containment will be provided in such a manner that any accidental spill of fuel will not be able to enter the water or contaminate sediments that may come in contact with water.

   b. Any equipment that is readily moved out of the waterway will not be fueled in the waterway or immediate floodplain.

   c. All fueling done at the job site will provide containment to the degree that any spill will be unable to enter any waterway or damage riparian vegetation.

8. No equipment servicing will be done in a stream channel or immediate floodplain, unless equipment stationed in these locations cannot be readily relocated (*i.e.*, pumps, generators).

   a. Any equipment that can be readily moved out of the channel will not be serviced in the channel or immediate floodplain.

   b. All servicing of equipment done at the job site will provide containment to the degree that any spill will be unable to enter any channel or damage stream vegetation.

   c. If emergency repairs are required in the field, only those repairs necessary to move equipment to a more secure location will be done in a channel or floodplain.

   d. If emergency repairs are required, containment will be provided equivalent to that done for fueling or servicing.

9. Measures will be implemented to ensure that hazardous materials are properly handled and the quality of water resources is protected by all reasonable means.

   a. Prior to entering the work site, all field personnel will know how to respond when toxic materials are discovered.
   b. The discharge of any hazardous or nonhazardous waste as defined in Division 2,

Subdivision 1, Chapter 2 of the California Code of Regulations will be conducted in accordance with applicable State and Federal regulations.

c. In the event of any hazardous material emergencies or spills, personnel will call the Chemical Emergencies/Spills Hotline at 1-800-510-5151.

10. Prevent the accidental release of chemicals, fuels, lubricants, and non-storm drainage water.

    a. Field personnel will be appropriately trained in spill prevention, hazardous material control, and cleanup of accidental spills.

    b. No fueling, repair, cleaning, maintenance, or vehicle washing will be performed in a creek channel or in areas at the top of a channel bank that may flow into a creek channel.

11. Spill prevention kits appropriate to the hazard will always be in close proximity when using hazardous materials (*e.g.*, crew trucks and other logical locations).

    a. Prior to entering the work site, all field personnel will know the location of spill kits on crew trucks and at other locations within SCVWD facilities.

    b. All field personnel will be advised of these locations and trained in their appropriate use.

12. Runoff from soil stockpiles will be avoided. If soil is to be stockpiled, no runoff will be allowed to flow to a creek.

13. Cofferdams will be used for tidal work areas. For tidal areas, a downstream cofferdam will be constructed to prevent the work area from being inundated by tidal flows. By isolating the work area from tidal flows, water quality effects are minimized. Downstream flows will continue through the work area and through pipes within the cofferdam.

    a. Installation of coffer dams will begin at low tide.

    b. Waters discharged through tidal cofferdam bypass pipes will not exceed 50 NTU over the background levels of the tidal waters into which they are discharged.

    c. Cofferdams shall not be constructed of earthen fill due to potential adverse water quality impacts in the event of a failure.

    d. Cofferdams constructed of gravel shall be covered by a protective covering (*e.g.*, plastic or fabric) to prevent seepage.

14. Groundwater will be managed at work sites. If high levels of groundwater in a work area are encountered, the water will be pumped out of the work site. If necessary to protect water quality, the water will be directed into specifically constructed infiltration basins, into holding ponds, or onto areas with vegetation to remove sediment prior to the water re-entering a

receiving water body. Water pumped into vegetated areas will be pumped in a manner that will not create erosion around vegetation.

15. Sanitary/septic waste will be managed. Temporary sanitary facilities will be located on jobs that last multiple days in compliance with California Division of Occupational Safety and Health regulation 8 California Code of Regulations 1526. All temporary sanitary facilities will be placed outside of the creek channel and floodplain and removed when no longer necessary.

In addition, as part of the Santa Clara Valley Urban Runoff Pollution Prevention Program and the San Mateo Countywide Stormwater Pollution Prevention Program, required under Waste Discharge Requirements and National Pollutant Discharge Elimination System permits for the discharge of storm water runoff from the municipal separate storm sewer systems (MS4s) overseen by the SFRWQCB, all construction sites are required to have site-specific and seasonally and phase-appropriate effective best management practices (BMPs) (SFRWQCB 2009). SFCJPA will be responsible for ensuring compliance with all local and State regulations, including the SFRWQCB National Pollutant Discharge Elimination System permits and local BMPs for jurisdictions adjoining the proposed project site. The proposed project specifications require that the proposed project construction contractor prepare a Storm Water Pollution Prevention Plan (SWPPP) and erosion control and sedimentation plan showing placement of BMPs at various stages of construction in conformance with requirements, and all SWPPP documents and plans will be stamped by a State-certified Qualified SWPPP Developer. The proposed project will implement measures to accomplish objectives specified in SFCJPA's *San Francisquito Creek Watershed Analysis and Sediment Reduction Plan*, which fulfills National Pollutant Discharge Elimination System permit provisions that require the co-permittees of the Santa Clara Valley Urban Runoff Pollution Prevention Program and San Mateo Countywide Stormwater Pollution Prevention Program within the San Francisquito Creek watershed to assess and implement sediment management measures in the watershed (SFCJPA 2004). Water quality protection standards during construction will comply with the most protective BMPs of the local jurisdictions and the State of California.

<u>Safe Use of Herbicides and Pesticides</u>

1. Pesticides products are to be used only after an assessment has been made regarding environmental, economical, and public health aspects of each of the alternatives. The following types of pesticides are used by the SCVWD.

    a. Herbicides are used to: control algae, weeds, and undesirable vegetation; to minimize fire hazards; to maintain flood conveyance of waterways; and to maintain compliance with State and Federal requirements.

    b. Insecticides are used only in and around SCVWD buildings, or in the case of a serious pest outbreak, on landscape and re-vegetation facilities; only after all other methods, such as prevention or natural nontoxic control methods, have proven ineffective; and where required, the lowest toxicity will be used in accordance with the label and the details of this policy.

    c. No rodenticides or fumigants will be used within or near suitable habitat for the salt marsh harvest mouse or California clapper rail. Methods of rodent control within or near salt marsh harvest mouse or California clapper rail habitat will be limited to live trapping. All live traps shall have openings measuring no smaller than two inches by one inch to allow any salt marsh harvest mouse that inadvertently enters the trap to easily escape. All traps will be placed outside of pickleweed areas and above the high tide line. In areas where rodenticides are used, carcass retrieval surveys will be conducted daily for acute toxins and weekly for anticoagulants to minimize secondary poisoning impacts during the use period. Any spilled bait will be cleaned up immediately. Alternatives such as trapping and smoke bombs are used wherever practical prior to rodenticide use.

2. All herbicide use will be consistent with approved product specifications and according to their labels. Applications will be made by, or under the direct supervision of, State-certified applicators under the direction of a licensed Pest Control Advisor.

3. Only herbicides and surfactants registered for aquatic use will be applied within the banks of channels within 20 feet of any water present. Aquatic herbicide use will be limited to July 1 through October 15. If rain is forecasted for the day, then application of aquatic herbicide will be rescheduled.

Construction Dust Control

1. Bay Area Air Quality Management District Basic Control Measures for construction emissions of particulate matter (PM10) will be implemented at all construction sites. Current measures stipulated by the Bay Area Air Quality Management District California Environmental Quality Act Guidelines include the following (Bay Area Air Quality Management District 2010):

    a. All exposed surfaces (*e.g.*, parking areas, staging areas, soil piles, graded areas, and unpaved access roads) will be watered two times per day under normal conditions. Watering periodicity can be increased or decreased as necessitated by site specific conditions as determined by the SFCJPA's designated construction manager and with the SFCJPA's approval.

    b. All haul trucks transporting soil, sand, or other loose material off the site will be covered.

    c. All visible mud or dirt track-out onto adjacent public roads will be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.

    d. All vehicle speeds on unpaved roads will be limited to 15 miles per hour.

    e. All roadways, driveways, and sidewalks to be paved will be completed as soon as possible. Building pads will be laid as soon as possible after grading unless seeding or soil binders are used.

    f. Idling times will be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations). Clear signage will be provided for construction workers at all access points.

g. All construction equipment will be maintained and properly tuned in accordance with manufacturer's specifications. All equipment will be checked by a certified mechanic and determined to be running in proper condition prior to operation.

2. A publicly visible sign will be posted with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person will respond and take corrective action as soon as is feasible and no later than 24 hours after the complaint is made. The Bay Area Air Quality Management District's phone number, as well as the contact numbers for the SFCJPA Project Manager, Designated Construction Manager, and a designated contact with the City of East Palo Alto will also be visible to ensure compliance with applicable regulations.

Biological Resources Protection

1. Prior to construction, worker awareness training must be conducted to inform proposed project construction workers of their responsibilities regarding sensitive environmental resources. The training will include environmental education about the salt marsh harvest mouse and California clapper rail and other special-status species and sensitive habitats (*e.g.*, in-stream habitat, riparian habitat, wetlands). The training will include visual aids to assist in identification of regulated biological resources, actions to take should protected wildlife be observed within the action area, and possible legal repercussions of affecting such regulated resources.

2. Existing access ramps and roads to waterways will be used where possible. If temporary access points are necessary, they will be constructed in a manner that minimizes effects on waterways:

    a. Temporary proposed project access points will be created as close to the work area as possible to minimize running equipment in waterways and will be constructed so as to minimize adverse effects.

    b. Any temporary fill used for access will be removed upon completion of the proposed project. Site topography and geometry will be restored to pre-project conditions to the extent possible.

3. Migratory bird nesting surveys will be performed prior to any proposed project-related activity that could pose the potential to affect migratory birds during the nesting season.

4. Nesting exclusion devices may be installed to prevent potential establishment or occurrence of nests in areas where construction activities would occur. All nesting exclusion devices will be maintained throughout the nesting season or until completion of work in an area makes the devices unnecessary. All exclusion devices will be removed and disposed of when work in the area is complete.

5. Effects on native aquatic vertebrates will be avoided or minimized. If native aquatic vertebrates are present when cofferdams, water bypass structures, and silt barriers are to be installed, an evaluation of the project site and the native aquatic vertebrates will be conducted by a qualified biologist. The qualified biologist will consider:

    a. Native aquatic species present at the site.

    b. The ability of the species to naturally recolonize the stream reach.

    c. The life stages of the native aquatic vertebrates present.

    d. The flow, depth, topography, substrate, chemistry, and temperature of the stream reach.

    e. The feasibility of relocating the aquatic species present.

    f. The likelihood the stream reach will naturally dry up during the work season. Based on consideration of these factors, the qualified biologist may make a decision to relocate native aquatic vertebrates. The qualified biologist will document in writing the reasons to relocate native aquatic species, or not to relocate native aquatic species, prior to installation of cofferdams, water bypass structures, or silt barriers. If the decision is made to relocate the native aquatic species, then the operation will be based on the SCVWD's Fish Relocation Guidelines.

6. Local ecotypes of native plants will be planted and appropriate erosion-control seed mixes will be chosen. Whenever native species are prescribed for installation on SCVWD fee properties or easements, the following steps will be taken by a qualified biologist or vegetation specialist:

    a. Evaluate whether the plant species currently grows wild in Santa Clara County.

    b. If the plant species currently grows wild in Santa Clara County, the qualified biologist or vegetation specialist will determine whether the plant installation must include local natives, *i.e.* grown from propagules collected in the same or adjacent watershed, and as close to the proposed project site as feasible.

    c. A qualified biologist or vegetation specialist will be consulted to determine which seeding option is ecologically appropriate and effective. The following guidelines will inform the biologist or vegetation specialist's determination.

    d. For areas that are disturbed, an erosion control seed mix may be used consistent with the SCVWD's Guidelines and Standards for Land Use Near Streams, Design Guide 5, "Temporary Erosion Control Options."

    e. In areas with remnant native plants, the qualified biologist or vegetation specialist may choose an abiotic application instead, such as an erosion control blanket or seedless hydro-mulch and tackifier to facilitate passive revegetation of native species.

f. Temporary earthen access roads may be seeded when site and horticultural conditions are suitable.

g. If a gravel or wood mulch has been used to prevent soil compaction, this material may be left in place (if ecologically appropriate) instead of seeding.

h. Seed selection will be ecologically appropriate as determined by a qualified biologist, per *Guidelines and Standards for Land Use Near Streams, Design Guide 2: Use of Local Native Species; and, Supplemental Landscaping/Revegetation Guidelines* (ISO document WQ71001).

7. Animal entry and entrapment will be avoided.

a. All pipes, hoses, or similar structures less than 12 inches diameter will be closed or covered to prevent animal entry. All construction pipes, culverts, or similar structures, greater than 2 inches diameter, stored at a construction site overnight, will be inspected thoroughly for wildlife by a qualified biologist or properly trained construction personnel before the pipe is buried, capped, used, or moved.

b. If inspection indicates presence of sensitive or State- or federally-listed species inside stored materials or equipment, work on those materials will cease until a qualified biologist determines the appropriate course of action.

c. To prevent entrapment of animals, all excavations, steep-walled holes or trenches more than 6 inches deep will be secured against animal entry at the close of each day. Any of the following measures may be employed, depending on the size of the hole and method feasibility.

d. Holes will be securely covered (no gaps) with plywood or similar materials at the close of each working day, or any time the opening will be left unattended for more than one hour.

e. In the absence of covers, the excavation will be provided with escape ramps constructed of earth or untreated wood, sloped no steeper than 2:1, and located no farther than 15 feet apart.

f. In situations where escape ramps are infeasible, the hole or trench will be surrounded by filter fabric fencing or a similar barrier with the bottom edge buried to prevent entry.

8. Identify and protect riparian habitats. To avoid unnecessary damage to or removal of riparian habitat, the SFCJPA will retain a qualified biologist or ecologist to survey and demarcate riparian habitat on or adjacent to the proposed areas of construction in the upper reach of San Francisquito Creek. Riparian areas not slated for trimming or removal to accommodate proposed project construction will be protected from encroachment and damage during construction by installing temporary construction fencing to create a no-activity exclusion zone. Fencing will be brightly colored and highly visible, and installed under the supervision of a qualified biologist to prevent damage to riparian habitat during installation. The fencing will protect all potentially affected riparian habitat consistent with

International Society of Arboriculture tree protection zone recommendations and any additional requirements of the resource agencies with jurisdiction. Fencing will be installed before any site preparation or construction work begins and will remain in place for the duration of construction. Riparian vegetation that must be trimmed will be trimmed by an International Society of Arboriculture certified arborist who will minimize stress and potential damage to trees and shrubs. Construction personnel will be prohibited from entering the exclusion zone for the duration of proposed project construction. Access and surface-disturbing activities will be prohibited within the exclusion zone.

9. Replace riparian habitat. The SFCJPA will be responsible for replacing permanently affected riparian habitat at a mitigation-to-effect ratio of 2:1 and temporarily affected riparian habitat at a minimum mitigation-to-effect ratio of 1:1 through the restoration or creation of marsh habitats consistent with the historical ecology of the project area. The SFCJPA will develop a MMP that describes this habitat replacement. The MMP will be developed in the context of the Federal and State permitting processes under the Clean Water Act and California Department of Fish and Game Code, and will include success criteria as specified by the permitting agencies. The MMP will also include adaptive management guidelines for actions to be taken if the success criteria are not met.

California Clapper Rail Measures

1. Work activities within 50 feet of California clapper rail habitat will not occur within two hours before or after extreme high tides (6.5 feet or above measured at the Golden Gate Bridge adjusted to the timing of local high tides) or when the marsh plain is inundated, which could prevent individuals from reaching available cover.

2. If work is to be conducted during the California clapper rail's breeding season (February 1 – August 31) within 700 feet of suitable habitat, a permitted biologist will be retained to conduct California clapper rail protocol-level surveys at the proposed project site in appropriate habitat for the California clapper rail. The surveys will be conducted following the Service's June 2015 survey protocol during the appropriate protocol-level survey period (*i.e.*, late January – April) prior to commencement of construction and maintenance activities (http://www.fws.gov/sfbaydelta/documents/June_2015__Final_CCR_protocol.pdf). Proposed project activities occurring within 700 feet of California clapper rail activity centers will occur only between September 1 and January 31 outside of the California clapper rail's breeding season.

3. Outside of the California clapper rail breeding season, a permitted biologist will be retained to conduct surveys of appropriate habitat for California clapper rails within the work area, including all staging and access routes, no more than seven days prior to initiation of work within suitable habitat. If California clapper rails are observed during this survey, a biologist will conduct an additional survey immediately prior to initiation of construction activities. If California clapper rails are observed within or near the work area, a no-disturbance buffer (minimum 50 feet) will be implemented. If the daily work area is expanded, then a qualified biologist will survey the suitable habitat prior to initiation of work and movement of equipment that day. No work will occur within the buffer until the biologist verifies that California clapper rail individuals have left the area.

4. If California clapper rails are routinely observed in the work area, a species avoidance plan will be developed in coordination with the Service and CDFW. If no California clapper rails are observed in accordance with the survey protocols, no buffers will be required. All vegetation removal within suitable California clapper rail habitat, as determined by a biologist, will be done by hand to the extent possible. If movement of heavy equipment is necessary in suitable habitat or within 50 feet of habitat, then a Service-approved biological monitor will observe the area in front of the equipment from a safe vantage point. If California clapper rails are detected within the area in front of the equipment, then the equipment will stop and the biologist will direct the equipment on an alternative path. If this is not possible, then equipment will stop until a clear path can be identified.

5. Additional conservation measures during the construction period will include:

    a. An annual search for and subsequent destruction of any cat feeding stations along public walkways shall be conducted.

    b. Before the onset of winter high tides, an annual capture and removal effort of feral cats and rats in the surrounding disturbed areas shall be conducted.

6. The SFCJPA will conduct protocol-level surveys for California clapper rail where potential impacts to rail habitat occur along the Faber Marsh levee and in San Francisquito Creek for the duration of mitigation monitoring, which is a minimum of five years. The purpose of the surveys will be to evaluate the effectiveness of the measures to support the California clapper rail population.

<u>Salt Marsh Harvest Mouse Measures</u>

1. Since the salt marsh harvest mouse can breed year-round, a species avoidance plan will be developed in consultation with the Service and CDFW and implemented. The avoidance plan, at a minimum, will include the following.

    a. Hand removal of vegetation shall start at the edge farthest from the largest contiguous salt marsh area and work its way towards the salt marsh, providing cover for salt marsh harvest mice and allowing them to move towards the salt marsh as vegetation is being removed.

    b. In consultation with CDFW and the Service, salt marsh harvest mouse-proof exclusion fencing shall be placed around a defined work area immediately following vegetation removal and before proposed project activities begin. All supports for the exclusion fencing will be placed on the inside of the work area to prevent salt marsh harvest mice from climbing the stakes into the work area. The salt marsh harvest mouse-proof exclusion fencing shall be at least two feet high but no higher than four feet. The fencing will be made of a heavy plastic sheeting material that is too smooth for salt marsh harvest mice to climb. The toe of the fence will be buried approximately four inches in the ground to prevent salt marsh harvest mice from crawling or burrowing underneath it. A four-foot buffer will be maintained free of vegetation around the exclusion fencing and work areas. The final design and proposed location of the fencing shall be reviewed and approved by CDFW and the Service prior to placement.

c. Prior to initiation of work each day within 300 feet of tidal or pickleweed habitats, a qualified biologist shall thoroughly inspect the work area and adjacent habitat areas to determine if salt marsh harvest mice are present. The biologist shall ensure the exclusion fencing has no holes or rips, and the base remains buried. The fenced area will be inspected daily to ensure that no mice are trapped.

2. Prior to initiation of work within suitable habitat, a Service-approved biologist will be retained to monitor the hand removal of pickleweed to avoid the injury or mortality of the salt marsh harvest mouse. Monitoring will occur for the duration of all clearing work within suitable habitat. If a salt marsh harvest mouse is observed during clearing activities, clearing will cease and workers will move to a new area. Clearing work may begin in the area of the observation one day or more after the observation date.

3. During the survey, if salt marsh harvest mouse individuals are observed, or if active nests of this species are observed, proposed project activities within 100 feet of the observation will be postponed and a no-disturbance buffer will be established. The buffer will remain in place until the biologist determines that the individuals have left the area (or if an active nest is found that all the salt marsh harvest mice have weaned) and are not present in or near (100 feet) of the work area. If no individuals are observed in accordance with the survey protocols, no buffers will be required.

4. Work activities within 50 feet of salt marsh harvest mouse habitat will not occur within two hours before or after extreme high tides (6.5 feet or above measured at the Golden Gate Bridge adjusted to the timing of local high tides) or when the marsh plain is inundated, which could prevent individuals from reaching available cover.

<u>Avoidance Measures during O&M Activities including Levee Mowing and Vegetation Management</u>

The following avoidance measures will be implemented during O&M activities including vegetation management and annual levee mowing to avoid the potential for injury and mortality of salt marsh harvest mice and California clapper rails.

1. Within seven days prior to work within the range of salt marsh harvest mouse or California clapper rail habitat, the proposed project area will be surveyed by a qualified biologist to identify specific habitat areas. Surveyed areas will include work locations and access routes.

2. To minimize or avoid the loss of individuals, activities within or adjacent to salt marsh harvest mouse and California clapper rail habitat will not occur within two hours before or after extreme high tides (6.5 feet or above measured at the Golden Gate Bridge adjusted to the timing of local high tides) when the marsh plain is inundated, because protective cover for those species is limited and activities could prevent them from reaching available cover.

3. Mowing will not occur at night.

4. Specific habitat areas are vegetated areas of cordgass, marsh gumplant, pickleweed, alkali heath, and other high marsh vegetation, brackish marsh reaches of creek with heavy accumulations of bulrush thatch (old stands), and high water refugia habitat that may include annual grasses, and shrubs immediately adjacent to channels. Within the identified specific habitat areas, vegetation will be removed by hand from areas to be directly impacted by the work activities if possible (hand removal of vegetation in some channels may not be possible). If within the mapped range of the salt marsh harvest mouse, but outside of areas identified as specific habitat areas, then other methods may be possible.

5. Prior to the initiation of work each day for all vegetation management work, ground or vegetation disturbance, operation of large equipment, grading, sediment removal, and bank stabilization work and prior to expanding the work area, if suitable habitat occurs within the immediate work area, a qualified biologist will conduct a preconstruction survey of all suitable habitat that may be directly or indirectly impacted by the day's activities (work area, access routes, staging areas).

    a. If during the initial daily survey or during work activities a California clapper rail is observed within or immediately adjacent to the work area (50 feet), initiation of work will be delayed until the California clapper rail leaves the work area.

    b. If during the initial daily survey or during work activities a salt marsh harvest mouse or similar rodent is observed within or immediately adjacent to the work area (50 feet), initiation of work will be delayed until a *Site Specific Species Protection Form* to protect the salt marsh harvest mouse or similar rodent is developed and implemented by the qualified biologist. Acceptable plan activities may include one or more of the following activities: (1) establishment of a buffer zone at least 50 feet in radius from the rodent; (2) ongoing active monitoring; and (3) delay of work activity until the qualified biologist can provide CDFW and the Service a suggested course of action and seek concurrence.

6. If mowing with hand equipment is necessary within 50 feet of habitat areas, an on-site monitor will observe the area in front of the mower from a safe vantage point while it is in operation. If salt marsh harvest mice are detected within the area to be mowed, no mowing will occur in that area. If a California clapper rail is detected within the area to be mowed, the mowing will stop until the individual(s) have left the work area.

7. If visual observation cannot confirm California clapper rails have left the work area, then it is assumed that the individual(s) remains in the work area and the work will not resume until the area has been thoroughly surveyed (and absence confirmed) or the Service has been contacted for guidance.

8. No rodenticides or fumigants will be used within the range of the salt marsh harvest mouse or California clapper rail as identified on SCVWD range maps. Methods of rodent control within salt marsh harvest mouse or California clapper rail habitat will be limited to live trapping. All live traps shall have openings measuring no smaller than 2 inches by 1 inch to allow any salt marsh harvest mouse that inadvertently enters the trap to easily escape. All traps will be placed outside of pickleweed areas and above the high tide line.

Predator Management

The SFCJPA will take the following actions to assist the Refuge and U.S. Department of Agriculture Wildlife Services in its efforts towards predator management at Faber Marsh and the adjacent Laumeister Marsh as follows:

1. Predator Trapping Assistance

    a. Financial contributions towards predator management activities. Since predation is believed to represent the greatest threat and in order to provide the maximum benefit possible to the salt marsh harvest mouse and California clapper rail, the SFCJPA will provide funding to augment current predator trapping activities, so that the desired activities in and around Faber and Laumeister Tract marshes are fully funded. The SFCJPA will enter in to a formal agreement with U.S. Department of Agriculture Wildlife Services for the provision of $8,000 per year with a 5 percent annual increase, the first payment to be made within 30 days after a Clean Water Act Section 404 permit is issued for the proposed project, for a total of five years.

    b. Install features to deter the public from entering trapping areas. Currently, trapping activities are limited along the levee that separates the Faber and Laumeister Tracts because of human activity. This levee is open to the public, and U.S. Department of Agriculture Wildlife Services is reluctant to place traps in areas where people may tamper with them, or be harmed by them. To provide for greater trapping opportunities, the SFCJPA will install a pole and cable feature, subject to municipal and regional access codes, to designate a trail location and alignment for the public. This will provide some "off-trail" space between the pole and cable in the Laumeister Tract marsh for trapping activities and reduce the likelihood of accidental human/trap interface. Installation will take place at the time of revegetation of the Main Faber Marsh northern perimeter levee.

    c. Provide access to new areas for trapping activities. Currently, U.S. Department of Agriculture Wildlife Services is limited in its trapping activities to areas within the Refuge. Trapping would likely be more effective if these activities could also take place in known predator access areas to the Refuge, but lie outside of the Refuge. There are certain parcels along and adjacent to the levee separating the Faber and Laumeister Tract marshes from developed areas in East Palo Alto that are owned by the City of East Palo Alto or the City of Palo Alto. The SFCJPA will work with its municipal partners to provide access agreements between the Cities and U.S. Department of Agriculture Wildlife Services to allow for trapping activities in these areas. Discussions with the Cities will begin at the time that formal Section 7 consultation on the proposed project is initiated with the Service.

2. Exclusionary Fencing. The SFCJPA will install a chain-link fence and gate across the levee that separates San Francisquito Creek and Main Faber Marsh to inhibit predator and human access to the marsh. In addition to inhibiting predator access, the fence will allow for more aggressive trapping activities along this levee and the levee that separates Main Faber Marsh and Outer Faber Marsh. The fencing will be installed upon completion of construction of the project features along the southern Main Faber Marsh levee beyond the proposed fence

location. The fence and gate will have the following features: 1-inch mesh chain link; 8 feet tall; vehicular gate with chained lock to allow access to multiple agencies; anti-perching feature on top; the fence shall extend on the marsh (north) side to the outboard toe of the high marsh transition zone; and the fence shall connect on the creek (south) side to the rail structure of the Friendship Bridge.

3. Raptor Perching Deterrents. The SFCJPA will modify 12 bridge marker poles to deter raptor perching. A cone-shaped cap will be placed at the top of each pole, and the capped poles will be maintained in a condition that deters predator access and raptor perching. Caps will be placed on the poles at the time of construction of the boardwalk project feature.

4. Trail Signage. The SFCJPA will coordinate with staff from the Palo Alto Baylands Preserve to install signs informing the public of the need to keep dogs leashed, with applicable municipal code citations, and establish a local enforcement strategy. Signage will be installed upon completion of the proposed project.

High Tide Refuge Islands

The SFCJPA will install five high-tide refuge islands in Outer Faber Marsh near the San Francisco Bay. These islands will be similar to those installed as part of the Invasive Spartina Project effort, which have successfully provided refuge during king tides throughout San Francisco Bay (H.T. Harvey & Associates 2015b). Each island will have a footprint of 0.007 acre (300 square feet, 10 feet by 30 feet). The islands will be planted with marsh gumplant and/or other native marsh species, and placed at an elevation that retains wetlands in the marsh. The SFCJPA and its partners will develop final design and dimensions, and determine final location of these islands in coordination with the Service, the Refuge, and H.T. Harvey & Associates (the consultant for the Invasive Spartina Project). Further details on the high-tide refuge islands installation will be provided in the proposed project's MMP and are available in the *San Francisquito Creek Flood Protection Project: Conceptual High-Tide Refuge Habitat Enhancement Plan* (H.T. Harvey & Associates 2015a). An example plan view and cross-section of a high-tide refuge island installed for the Invasive Spartina Project is illustrated in Figures 3 and 4 below. The approximate locations of the five high tide refuge islands to be installed in Outer Faber Marsh are shown in Figure 5 below.

Each of the five high-tide refuge island sites proposed for construction in Outer Faber Marsh will consist of one excavation area (if necessary), one refuge island, and an elevation control stake. Prior to construction, a restoration ecologist will ground-truth the location of refuge islands selected during the stakeholder meeting. Refuge island sites will be accessed on foot outside of the California clapper rail's breeding season (*i.e.*, after September 1). The restoration ecologist may adjust the location of refuge island sites based on field conditions in order to maximize the benefit of island sites for California clapper rail and facilitate construction.

During pre-construction ground-truthing, a white polyvinyl chloride (PVC) pipe will be installed at each island site so that the top of the PVC pipe is at Mean Higher High Water (MHHW). During refuge island construction, the elevation of each island and the maximum depth of the excavation area will be determined via measurement (with a laser level) to the elevation control stake.
The refuge islands will be built to be approximately 25-foot long by 10-foot wide with island tops approximately 2-3 feet above the marsh plain and located adjacent to a tidal marsh slough channel.

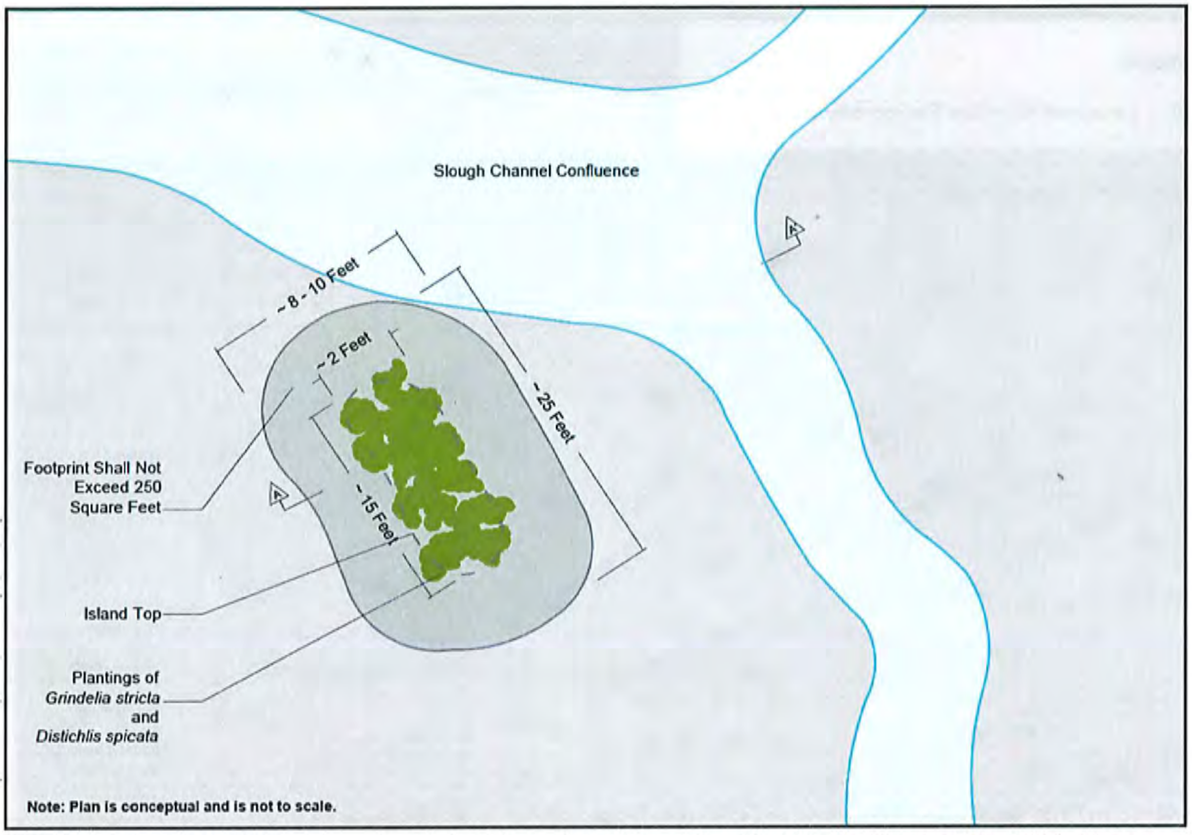

Figure 3. Typical plan view of a high-tide refuge island (copied from Figure 7 in H.T. Harvey & Associates (2015a)).

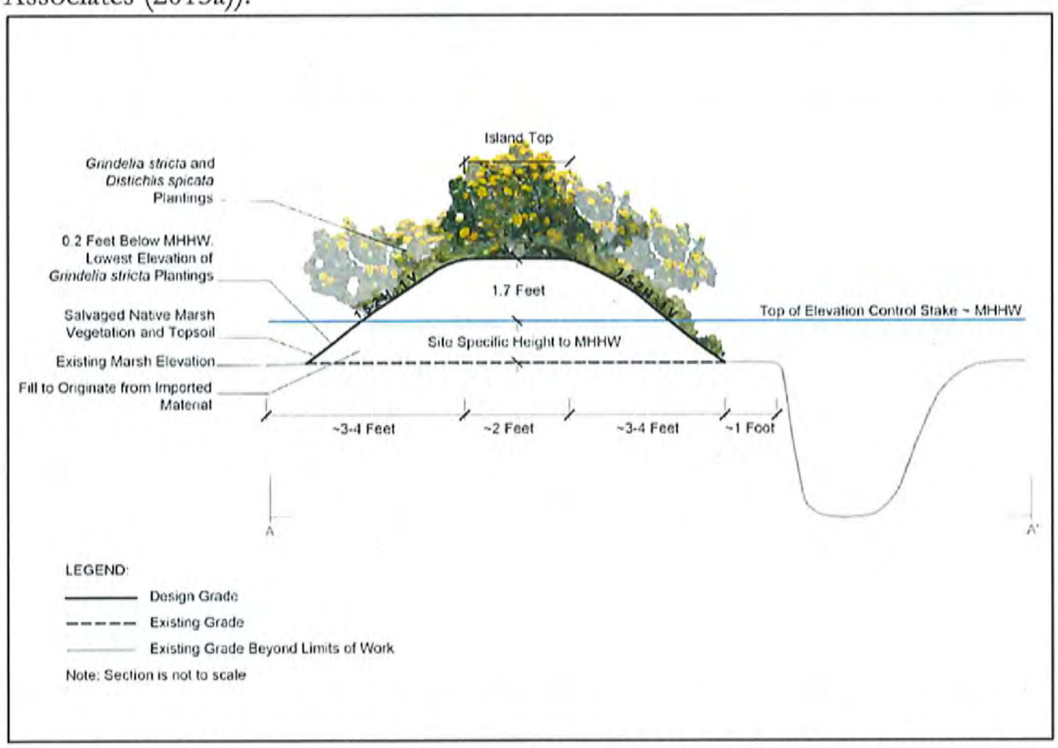

Figure 4. Typical cross-section of a high-tide refuge island (copied from Figure 8 in H.T. Harvey & Associates (2015a)).

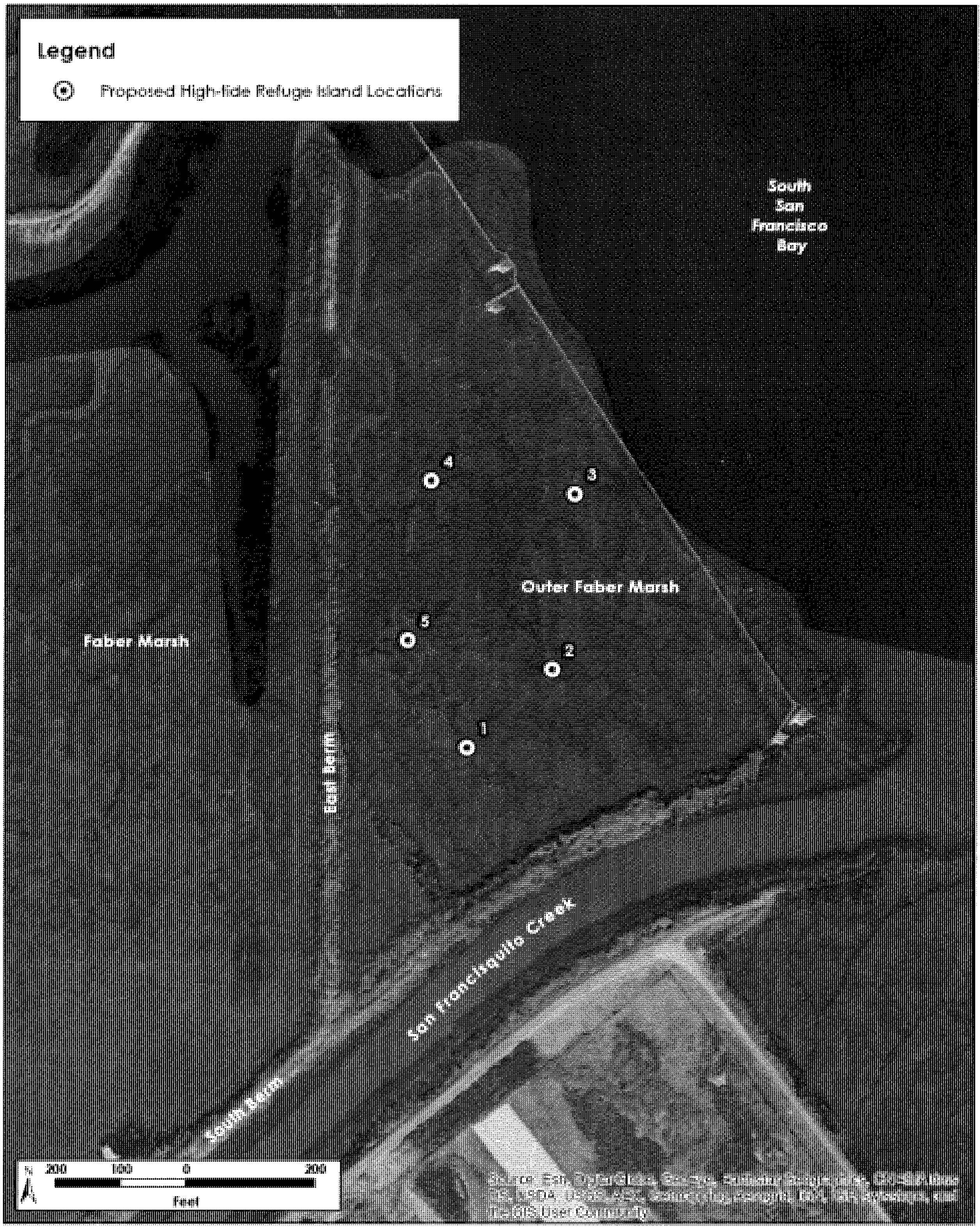

Figure 5. Approximate locations where high-tide refuge islands will be installed in Outer Faber Marsh (copied from Figure 6 in H.T. Harvey & Associates (2015a)).

There are two general methods that may be used for refuge island construction: the use of in-situ bay mud collected from the marsh or via the import of terrestrial soil. The construction methods will be determined based on soil conditions (particularly moisture content) and logistical considerations. If it is infeasible to use bay mud, clean terrestrial soil will be imported to each island site using hand-tools. The fill may be transported to the marsh by dump truck to the nearest feasible access point, but no vehicles will enter marsh habitats. The contractor may also use boats (*e.g.*, airboats) to import soil to Outer Faber Marsh, if that method is more logistically suitable. Ecologists for H.T. Harvey & Associates found that marsh mud in the footprint of the proposed refuge island locations in Outer Faber Marsh is too saturated and unconsolidated and therefore, not recommended for refuge island construction (H.T. Harvey & Associates 2015a). Instead, the ecologists for H.T. Harvey & Associates recommend that refuge islands be constructed using imported terrestrial fill. Use of terrestrial fill for construction will also reduce temporary impacts to Outer Faber Marsh which would have been caused by excavating in-situ marsh mud (H.T. Harvey & Associates 2015a).

Crews of approximately five to eight people will access and construct each refuge island over a one to two day period, during low tides. Refuge islands will be constructed by hand using shovels and other hand tools, from approximately 11 to 22 cubic yards of imported clean terrestrial fill meeting the specifications provided in Table 4 of H.T. Harvey & Associates (2015a). Terrestrial fill will be transported to island sites across the marsh from an adjacent berm using wheelbarrows (either hand operated or gas powered). A temporary plywood path will be laid down on the day of construction from the berm to the island site to protect marsh vegetation during transport of fill material. The surface area of fill at each refuge island site will be a maximum of 250 square feet (see Figures 4 and 5 for typical dimensions).

Prior to construction, approximately 4-6 vertical inches of the existing marsh vegetation, root structure, and sediment (hereafter, marsh sod) will be salvaged from the surface of the refuge island construction footprint. Following marsh sod removal, terrestrial fill will be placed in the island footprint, elevating an area of approximately 12 square feet (the island crest) to an elevation of approximately 1.7 feet above MHHW. Island tops will settle to approximately 1.3 feet above MHHW over a five-year period. Island tops will be flooded periodically during spring tides. Crews will make an effort to complete excavation and construction of each island during one low-tide cycle. However, if refuge island construction is not completed before the tide rises, measures such as tarping the excavated and salvaged materials will be employed to protect water quality until construction is completed during the following low-tide cycle. A total of about 8,250 square feet (0.19 acre) of tidal marsh habitat will be temporarily disturbed during construction of the five high-tide refuge islands in Outer Faber Marsh.

After the refuge island substrate is manually constructed and graded, salvaged marsh sod will then be placed on the top and side slopes of the constructed island to facilitate habitat establishment and erosion control. Moreover, the upper portion of each island will be densely planted with gumplant and saltgrass from container stock to facilitate establishment of refuge habitat. Marsh gumplant container stock (50, 1 gallon container plants per island) will be installed on 2-foot centers. Saltgrass will also be installed from container stock at all islands, next to each of the marsh gumplant plantings (50 saltgrass treeband container plants per island). Container plants will be purchased from a qualified plant nursery and collected from source populations located around the margins of southern San Francisco Bay (South Bay) (south of the San Mateo Bridge). An 8-12 month lead time prior to plant installation is typically necessary to contract grow the plants. Saltgrass planting is intended to facilitate establishment of increased cover for refugia because saltgrass grows vertically into marsh gumplant canopies. Once mature, the planted marsh gumplant will provide high-tide refuge canopy extending approximately 2-3 feet above the highest predicted spring tides.

A qualified biologist will work with the contractor to reduce and minimize the impacts on wetlands from island construction access. Access to and from all refuge island sites will be conducted by foot from the nearest levee access point. During island construction, marsh vegetation roots and substrate will be thoroughly protected from damage. Protective materials such as plywood sheets (or equivalent) will be temporarily installed (for a maximum of two to three days) to completely cover all vegetated marsh areas that will be regularly accessed by workers and biologists during island construction, including the access pathways to construction sites and vegetation immediately surrounding the refuge island construction sites.

All dead marsh gumplant individuals will be replaced during the first two years of the plant establishment period. Additional plant replacement may occur in the third year if the Year 3 marsh gumplant performance criteria are not met. During the three year plant establishment period trash deposited within the planting areas will be removed when maintenance activities are performed.

The high-tide refuge islands will be monitored annually for five years. Monitoring will occur between September 1 and December 1 so that monitoring falls outside of the California clapper rail's breeding season (February 1 – August 31) and before mid-winter when high marsh vegetation has typically senesced. The first annual monitoring event will occur at the end of the first growing season following plant installation. High quality high-tide refuge habitat for California clapper rail and salt marsh harvest mouse should be at an appropriate elevation and sufficiently covered by native salt marsh vegetation to provide protection from flooding and predators during extreme high-tide events. Therefore, the final success criteria among high-tide refuge islands after five growing seasons will be as follows:

1. The average foliar cover among the refuge islands will be at least 70 percent provided by native plant species.

2. The average marsh gumplant canopy cover among the refuge islands will be at least 30 percent.

3. The average marsh gumplant height among the refuge islands will be at least 1.5 feet.

4. The average invasive plant foliar cover on each island will be less than 5 percent.

5. The average crest elevation of the ground surface among the refuge islands will be at least +0.8 feet above MHHW.

An Annual Monitoring Report will be submitted to the permitting agencies by February 1 following each monitoring year. Monitoring Reports will present the findings of the annual field surveys relative to the performance standards in the monitoring plan described above.

Transition Zone Habitat Enhancement along Faber Marsh Levees and Berms

The SFCJPA will remove invasive species from the levees and berms surrounding and within Main Faber Marsh and Outer Faber Marsh (with the exception of the western levee of Main Faber Marsh, which is being enhanced by the City of East Palo Alto as part of the habitat compensation requirements in the Runnymede Storm Drainage Improvements Phase II and O'Connor Pump Station Outfall Structure Repair Project (Service file number 81420-2011-F-0103-2, Service 2013b)) and revegetate them with appropriate marsh transition zone vegetation. The planting plan and plant palette will be designed to restore vegetation structure and composition that will provide high tide refuge habitat for the California clapper rail and salt marsh harvest mouse and will be subject to review and approval by the Service and the Refuge. The approximate areas and lengths of Faber Marsh levees where transition zone habitat will be enhanced are: northern levee 2.44 acres, 2,210 linear feet; southern levee 1.87 acres, 1,530 linear feet; and eastern levee 1.35 acres, 1,380 linear feet (Figure 6) (note the original estimate of 2.77 acres of north levee enhancement shown in Figure 6 has been revised by SFCJPA to 2.44 acres based on recent field data provided by H.T. Harvey & Associates) (K. Murray, SFCJPA, *in litt.* 2015e). The 1,530 linear feet of south levee enhancement is parallel to construction impacts on top of the levee as shown in Figure 6. The total amount of high tide refuge habitat enhancement on the Faber Marsh levees proposed by the proposed project is about 5.66 acres and approximately 5,120 linear feet. Functions and values of the native plant patches existing on the levees and the adjacent tidal marsh will be enhanced by habitat connectivity. More details on the transition zone habitat enhancement are available in the *San Francisquito Creek Flood Protection Project: Conceptual High-Tide Refuge Habitat Enhancement Plan* (H.T. Harvey & Associates 2015a).

The three plant palettes for transition zone habitat enhancement are Upland Plant Palette, Ecotone Plant Palette, and High Marsh Plant Palette and are described below and in H.T. Harvey & Associates (2015a):

1. Upland Plant Palette. These species will be installed in the Upland Planting Zone. This zone is commonly located on the tops of berms beyond the reach of tides. The graminoid and shrub species selected are either salt-sensitive or moderately salt tolerant. The soils in this zone are generally non-saline. Forb and grass species to be planted in the Upland Plant Palette include western ragweed, saltgrass, creeping wild rye, western goldenrod, bee-plant, and Pacific aster. Shrub species to be planted in the Upland Plant Palette include California sagebrush, marsh baccharis, lizard tail, and marsh gumplant.

2. Ecotone Plant Palette. These species will be installed in the Ecotone Planting Zone. This zone is located above the pickleweed-dominated high marsh and below the Upland Planting Zone and is occasionally inundated by the tides. These species consist of tidal salt marsh upland ecotone specialists such as saltgrass and marsh gumplant but also include high marsh and upland plants. The soils in this zone are moderately saline. Forb and grass species to be planted in the Ecotone Plant Palette include western ragweed, saltgrass, creeping wild rye, alkali heath, and perennial pickleweed. Shrub species to be planted in the Upland Plant Palette include California sagebrush, marsh baccharis, lizard tail, and marsh gumplant.

3. High Marsh Plant Palette. These species will be installed in the High Marsh Planting Zone. This planting palette consists of marsh gumplant interplanted into the existing native

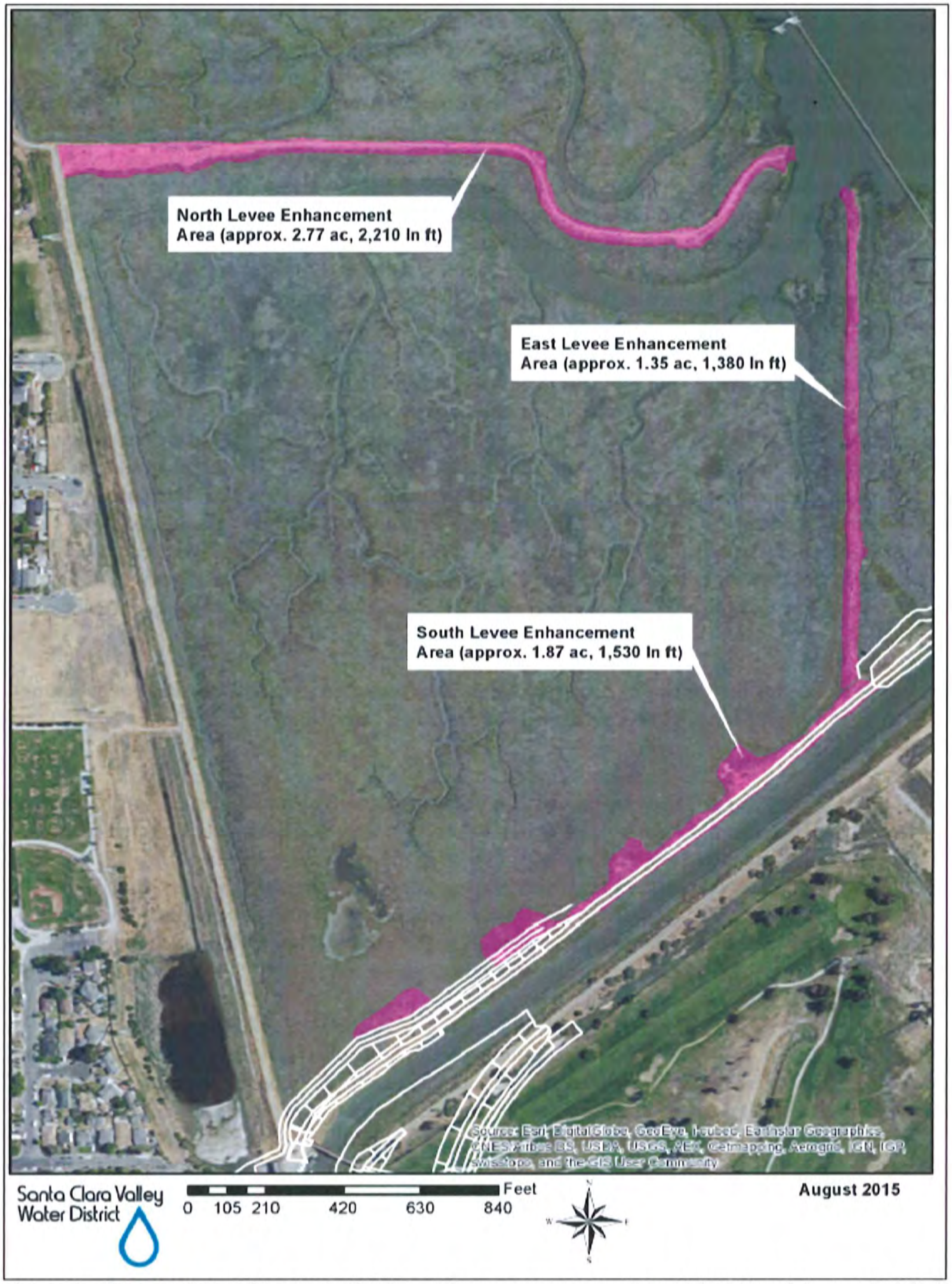

Figure 6. Proposed transition zone habitat enhancement areas along Faber Marsh levees (copied from Figure 1 in K. Murray, SFCJPA, *in litt.* 2015c).

pickleweed marsh to enhance high-tide refuge habitat. The soils in this zone are highly saline.

Plants will be installed between November 1 and January 31, during the rainy season and outside of the California clapper rail's breeding season. Plantings will require initial maintenance during a three-year plant establishment period following installation to become self-sustaining. The goal of habitat enhancement site maintenance is to facilitate the establishment of the target vegetation in the planting areas. Planting area maintenance during the three-year period will include dead plant replacement, irrigation, weed control, and trash removal. Irrigation will be placed that minimizes the access required to water the plants. A Service-approved biologist will be present if access is required during the California clapper rail's breeding season to the eastern berm of Main Faber Marsh.

In addition to this maintenance plan, annual site observations and data collected by a qualified restoration ecologist may be used to further specify maintenance actions necessary to establish the planting areas. All dead woody plants will be replaced during the first two years of the plant establishment period. Additional plant replacement may occur in the third year if the Year 3 percent shrub cover criterion is not met. Berm revegetation areas will require invasive plant control during the three-year plant establishment period. Potential weed removal treatments include hand-pulling and herbicide use. All herbicides used will be approved by the U.S. Environmental Protection Agency and the Refuge (*i.e.*, through a Refuge-approved Pesticide Use Proposal). Herbicide application will be guided by the Refuge's Comprehensive Conservation Plan for weed management (Service 2012c; Service, in prep.). Herbicides approved by the Refuge for terrestrial use include: Round-up, Glypro Plus, Roundup Pro, KleenUp Pro, Aquamaster and Rodeo (glyphosate), Garlon 4 Ultra (triclopyr), Habitat and Polaris (imazapyr), Milestone VM Plus and Capstone (aminopyralid and triclopyr), Telar (chlorsulfuron) and Transline (clopyralid). Herbicides approved by the Refuge for aquatic use include Habitat and Polaris (imazapyr) and Aquamaster, Roundup Custom, and Rodeo (glyphosate). The application of any pesticide, including herbicides, will be conducted in accordance with a Refuge-approved Pesticide Use Proposal. An annual pesticide use report will be completed for every Pesticide Use Proposal by January 31 each year for the previous year's activities. A qualified biologist will assess the type, distribution, and abundance of invasive plant species during annual monitoring and, when warranted, recommend effective control measures.

Non-native plant removal in breeding habitat during the California clapper rail's breeding season will be minimized to the maximum extent feasible. The eastern berm of Main Faber Marsh will not be accessed during the California clapper rail's breeding season unless a Service-approved biologist is present. Access to northern and southern berms of Main Faber Marsh during the California clapper rail's breeding season will be limited to the trail on the northern berm and the middle seeded area on the southern berm.

The transition zone habitat enhancement areas will be monitored for at least five years to ensure success criteria are met for the establishment of suitable native transition zone vegetation and the removal of invasive plant species. The forthcoming levee revegetation plan (to be included in the MMP) will be subject to the review and approval of the Service and the Refuge and will include the following vegetation success criteria to determine whether the revegetated levee(s) are on a trajectory to successfully establish high tide refuge habitat for California clapper rail and salt marsh harvest mice. The berm enhancement area should be sufficiently covered by a scattered patchwork of dense native shrubs within a matrix of non-invasive forb/grass-dominated vegetation to provide protection from flooding and predators for the California clapper rail and salt marsh harvest mouse during extreme high-tide events. The shrub patches are intended to provide escape cover for California clapper rails and the intervening forb/grass vegetation between the shrub patches is intended to provide escape cover for salt marsh harvest mice. The shrub patches are also intended to remain discrete patches (rather than long, contiguous shrub habitat) to minimize use by mammalian predators. Therefore, the final success criteria among the upland, ecotone, and high marsh planting zones after five growing seasons will be as follows (H.T. Harvey & Associates 2015a; K. Murray, SFCJPA, *in litt.* 2015c):

1. Native shrub patches will be 20-80 feet long, at least 4 feet wide (as measured from the widest portions of the plant canopies), and have a minimum of 60 percent average canopy cover provided by native shrubs. Canopy cover includes the area within the general perimeter of the shrub canopy.

2. The distance between the outer boundaries of native shrub patches (with the characteristics described above) will be 25-200 feet; 200 feet is selected as a maximum as it equals the approximate radius of the California clapper rail's home range.

3. The forb/grass revegetation areas (located between the native shrub patches) will have at least 60 percent average foliar cover (all forb/grass areas combined) provided by non-invasive, herbaceous vegetation; non-invasive herbaceous species are those that are not listed as "high" negative ecological impact by the California Invasive Plant Council (Cal-IPC) (Cal-IPC 2015) and are also not listed as weed species with "highest priority" and "high priority" rankings for control by the Service's *South San Francisco Bay Weed Management Plan* (Marriott *et al.* 2013). Foliar cover is the absolute area of ground covered by plant species.

4. The berm enhancement area (shrub patches and forb/grass areas) will have less than 5 percent average foliar cover of invasive plant species. Invasive species are those that have "high" negative ecological impact as rated by Cal-IPC (Cal-IPC 2015) and weed species with "highest priority" and "high priority" rankings for control by the *South San Francisco Bay Weed Management Plan* (Marriott *et al.* 2013).

An Annual Monitoring Report will be submitted to the permitting agencies by February 1 following each monitoring year. Monitoring Reports will present the findings of the annual field surveys relative to the performance standards in the monitoring plan described above.

<u>Revegetation and Monitoring and Invasive Plant Species Control</u>

The SFCJPA will monitor the re-vegetation in the channel and on levees for a minimum of five years to ensure they are successfully established with suitable native plant species and meet the success criteria under a Service-approved MMP. Monitoring will include the removal of any invasive plants.

<u>Action Area</u>

The action area is defined in 50 CFR § 402.02, as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." For the proposed project, the action area encompasses all suitable tidal marsh, transition zone, and upland refugia habitat for the salt marsh harvest mouse and California clapper rail along the 7,450-foot length of San

Francisquito Creek between San Francisco Bay and the East Bayshore Road/Highway 101 Bridge. The action area also includes all suitable upland foraging/dispersal habitat and diked marsh habitat for the salt marsh harvest mouse contiguous with and within 328 feet of suitable tidal marsh habitat along San Francisquito Creek between San Francisco Bay and the East Bayshore Road/Highway 101 Bridge. The action area also includes all suitable tidal marsh, transition zone, and upland refugia habitat within the approximately 81.5-acre Refuge-managed Main Faber Marsh and the adjacent approximately 13.8-acre Outer Faber Marsh (*i.e.*, the triangle-shaped marsh between Main Faber Marsh and San Francisco Bay) that would be indirectly affected by altered hydrology and predator management. The action area also includes the adjacent 91-acre Refuge-managed Laumeister Marsh where predator management would be implemented for the benefit of the salt marsh harvest mouse and California clapper rail.

Analytical Framework for the Jeopardy Analysis

In accordance with policy and regulation, the jeopardy analyses in this biological opinion relies on four components: (1) the *Status of the Species*, which evaluates the salt marsh harvest mouse's and California clapper rail's range-wide condition, the factors responsible for that condition, and their survival and recovery needs; (2) the *Environmental Baseline*, which evaluates the condition of the salt marsh harvest mouse and California clapper rail in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the salt marsh harvest mouse and California clapper rail; (3) the *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the salt marsh harvest mouse and California clapper rail; and (4) *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the salt marsh harvest mouse and California clapper rail.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the salt marsh harvest mouse's and California clapper rail's current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of these species in the wild.

The jeopardy analysis in this biological opinion places an emphasis on consideration of the range-wide survival and recovery needs of the salt marsh harvest mouse and California clapper rail and the role of the action area in the survival and recovery of salt marsh harvest mouse and California clapper rail as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Status of the Species

Salt Marsh Harvest Mouse

There are two subspecies of the salt marsh harvest mouse: the northern subspecies (*R. r. halicoetes*) and the southern subspecies (*R. r. raviventris*). Both subspecies are listed as endangered. The status of the salt marsh harvest mouse and information about its biology, ecology, distribution, and current threats is available in the *Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* (Recovery Plan) (http://ecos.fws.gov/docs/recovery_plan/TMRP_Final.pdf; Service 2013a). Critical habitat has not been designated for this species. No change in the species' listing status was recommended in the February 2010 5-year review (Service 2010). Threats evaluated during that review and discussed in the Recovery Plan have continued to act on the species since the February 2010 5-year review and the August 27, 2013 Recovery Plan were finalized, with loss of habitat being the most significant effect. While there have been continued losses of salt marsh harvest mouse habitat throughout the various recovery units, including the Central/South San Francisco Bay Recovery Unit where the proposed project is located, to date no project has proposed a level of effects for which the Service has issued a biological opinion of jeopardy for the species. The Service is in the process of finalizing its most current 5-year review for the species.

California Clapper Rail

The status of the California clapper rail and information about its biology, ecology, distribution, and current threats is available in the Recovery Plan (http://ecos.fws.gov/docs/recovery_plan/TMRP_Final.pdf; Service 2013a). Critical habitat has not been designated for this species. Threats evaluated in the Recovery Plan have continued to act on the species since the August 27, 2013 Recovery Plan was finalized, with loss of habitat and predation being the most significant effects. While there have been continued losses of California clapper rail habitat throughout the various recovery units, including the Central/South San Francisco Bay Recovery Unit where the proposed project is located, to date no project has proposed a level of effects for which the Service has issued a biological opinion of jeopardy for the species. The Service is in the process of finalizing its most current 5-year review for the species.

Environmental Baseline

San Francisquito Creek

San Francisquito Creek is a perennial stream that drains a 45-square-mile basin. There are about 7,450 linear feet of San Francisquito Creek within the action area for the proposed project between San Francisco Bay and the East Bayshore Road/Highway 101 Bridge. The 2,850-foot-long lower reach of San Francisquito Creek (San Francisco Bay to Friendship Bridge) is located between the tidal marshes of Main Faber Marsh and Outer Faber Marsh to the north (right bank) and the Palo Alto Municipal Golf Course to the south (left bank) (Figure 1). The lower reach of San Francisquito Creek contains tidal marsh dominated by tule, marsh gumplant, alkali heath, and saltgrass and provides suitable breeding, foraging, and dispersal habitat for salt marsh harvest mice and California clapper rails. The middle and upper reaches of San Francisquito Creek (upstream of Friendship Bridge) within the action area are less tidally influenced and transition from brackish to freshwater riparian habitat; the middle and upper reaches are less suitable for salt marsh harvest mouse and California clapper rail foraging and dispersal. The quality of the tidal and brackish marsh within the middle and upper reaches of the creek is degraded due to the relatively sparse vegetative cover, frequent inundation during winter storms, the marsh is highly fragmented and located within a highly urbanized environment, and the presence of ruderal and invasive plant species (*e.g.*, perennial pepperweed) and avian and mammal predators (*e.g.*, raptors, feral cats, skunks, red foxes, opossums, crows, and western scrub-jays).

Main Faber Marsh

Main Faber Marsh is a very high quality approximately 81.5-acre restored tidal marsh managed by the Refuge that supports one of the highest density populations of the California clapper rail range-wide (Liu *et al.* 2012; L. Liu, Point Blue Conservation Science, pers. comm. 2014) and a population of the salt marsh harvest mouse. Main Faber Marsh is located immediately north of the lower reach of San Francisquito Creek, east of a residential neighborhood of the City of East Palo Alto, south of the Refuge-managed native tidal marsh of Laumeister Marsh, and west of Outer Faber Marsh and San Francisco Bay. The tidal marsh of Main Faber Marsh is dominated by pickleweed, cordgrass, and salt grass.

Levees and berms surrounding the majority of Main Faber Marsh reduce the frequency of fluvial and tidal flooding of the tidal marsh which benefits the salt marsh harvest mouse and California clapper rail. Salt marsh harvest mice and California clapper rails are more vulnerable to predation during flooding events when suitable unsubmerged cover is limited (Albertson 1995, Overton *et al.* 2014, Service 2013a). Salt marsh harvest mouse nests may be inundated during flooding events resulting in the loss of all mice within the nest (R. Perrera, Huffman-Broadway Group, Inc., pers. comm. 2012). Therefore, the levees and berms around Main Faber Marsh provide some benefit to the salt marsh harvest mouse and California clapper rail by reducing the frequency of flooding of the tidal marsh. However, the levees and berms also provide pathways for mammal predators into the marsh which increases the risk of predation on salt marsh harvest mice and California clapper rails in Main Faber Marsh.

Vegetation within the transition zone habitat along the levees and berms of Main Faber Marsh also provides important upland refugia cover for salt marsh harvest mice and California clapper rails during extreme high tide and flooding events by providing shelter for the mice and the rails from avian and mammalian predators. However, the quality of the vegetation along the levees and berms around Main Faber Marsh is degraded due to the presence of invasive plant species like perennial pepperweed and mustard that provide poor quality high-tide refugia cover because these plants are leafless in the winter when the salt marsh harvest mouse and California clapper rail are in most need of suitable high-tide refugia cover during the more frequent storm and extreme high tide events. The existing berms provide poor quality high tide refuge habitat for salt marsh harvest mouse and California clapper rail due to a lack of suitable canopy structure because the existing vegetation is dominated by low-growing perennials, frequent bare patches, and monotypic patches of annual plants (*e.g.*, black mustard) (H.T. Harvey & Associates 2015a). Pickleweed cover on berm side slopes provides good cover for the salt marsh harvest mouse, but does not provide sufficient escape cover from predators for California clapper rail during extreme high-tides (H.T. Harvey & Associates 2015a). H.T. Harvey & Associates (2015a) reports that refuge habitat for the California clapper rail could be substantially improved on berm side-slopes at Main Faber Marsh if native shrub patches were planted.

Without suitable high-tide refugia cover, the salt marsh harvest mouse and California clapper rail are vulnerable to predation during extreme high tide and flooding events when suitable unsubmerged cover is limited. The tops of the north and east berms of Main Faber Marsh are largely dominated by low growing non-native plants such as slenderleaf iceplant, ripgut brome, and highway iceplant, monotypic stands of annual black mustard, and small isolated patches of perennial pepperweed (H.T. Harvey & Associates 2015a). Low-growing native plants such as alkali heath and saltgrass also occur at relatively low abundance compared to non-native species (H.T. Harvey & Associates 2015a). Along the tops of the southern berm and the western end of the northern berm of Main Faber Marsh (where soils are non-saline), annual non-native plants such as wild oats, black mustard, and ripgut brome are dominant (H.T. Harvey & Associates 2015a). Berm side-slopes are primarily covered with native perennial pickleweed with scattered patches of marsh gumplant and other high marsh vegetation.

A levee on the western side of Main Faber Marsh contains a pedestrian trail (the San Francisco Bay Trail) which separates the tidal marsh of Main Faber Marsh from the residential neighborhood of the City of East Palo Alto to the west. The City of East Palo Alto is currently enhancing transition zone habitat for the salt marsh harvest mouse and California clapper rail along about 2,100 linear feet (0.58 acre) of the outboard (Main Faber Marsh) side of this levee between Runnymede Street and San Francisquito Creek (WRA Environmental Consultants 2013). The transition zone habitat enhancement being conducted by the City of East Palo Alto is compensation for the effects of the temporary disturbance of about 3.6 acres of salt marsh harvest mouse and California clapper rail habitat along the inboard (City of East Palo Alto) side of this levee in the Runnymede Storm Drainage Improvements Phase II and O'Connor Pump Station Outfall Structure Repair Project (Service file number 81420-2011-F-0103-2, Service 2013b).

A berm along the southern edge of Main Faber Marsh separates the tidal marsh of Main Faber Marsh from the San Francisquito Creek channel. The quality of transition zone habitat along the southern berm of Main Faber Marsh is also low due to dominance of invasive mustard. An approximately 400-foot-long low spot in this berm downstream of the Friendship Bridge allows the five-year flood event to overtop the berm and flood Main Faber Marsh (20 percent chance of happening once in any given year) during average tidal conditions. The potential for flood flows spilling from San Francisquito Creek into Main Faber Marsh are currently limited by flow constrictions upstream (such as the Pope-Chaucer Bridge, Highway 101, and the channel near Highway 101) that reduce the amount of flows able to reach the lower reach of San Francisquito Creek and spill over into Main Faber Marsh. However, in 2015, Caltrans initiated construction of the enlargement of the U.S. Highway 101/East Bayshore Road Bridge (Caltrans facility) over San Francisquito Creek to increase the channel capacity to 9,400 cubic feet per second (cfs), the 100-year flood event for San Francisquito Creek. Once the enlargement of the Caltrans facility is completed, the maximum fluvial flood flow that could reach the lower reach of San Francisquito Creek adjacent to Main Faber Marsh will increase to 7,400 cfs. A 7,400 cfs fluvial flood flow in the lower reach of San Francisquito Creek would result in about 1,025 cfs of flow spilling into Main Faber Marsh during the 100-year flood event under average high tide conditions (an increase of 715 cfs over the 310 cfs of flow spilling into Main Faber Marsh during the 100-year flood flow under existing conditions) (M. Jones, ICF International, *in litt.* 2014). Flow constrictions further upstream (*e.g.*, Middlefield Road Bridge) will still limit the ability of the San Francisquito Creek channel to pass the 9,400 cfs 100-year flood event. The flow constriction at the Middlefield Road Bridge only allows 6,700 cfs to pass through the San Francisquito Creek channel. Pump stations downstream of Middlefield Road Bridge contribute an additional 700 cfs of flood flows to the San Francisquito Creek channel resulting in a total maximum flood flow of 7,400 cfs that could pass through the lower reach of San Francisquito Creek and the spilling of 1,025 cfs of flows into Main Faber Marsh once construction of the Caltrans facility is completed. Thus, once construction of the Caltrans facility is completed, the volume and frequency of flood flows entering Main Faber Marsh will increase resulting in an increased risk of predation on California clapper rails and salt marsh harvest mice and the flooding of salt marsh harvest mouse nests.

Outer Faber Marsh

Outer Faber Marsh is an approximately 13.8-acre triangle-shaped, low-elevation tidal marsh area located between Main Faber Marsh to the west, San Francisco Bay to the east, and immediately north of the mouth of San Francisquito Creek. Outer Faber Marsh is at a lower elevation than Main Faber Marsh and is dominated primarily by Pacific cordgrass with perennial pickleweed primarily located adjacent to the eastern and southern perimeter berms and along some channel edges (H.T. Harvey & Associates 2015a). Marsh gumplant grows in small patches along some of the tidal channels in Outer Faber Marsh. Overall, the marsh lacks sufficient high-tide refuge cover for the California clapper rail (H.T. Harvey & Associates 2015a). Additionally, the majority of the marsh also lacks high quality refuge cover for the salt marsh harvest mouse due to the relatively low elevations of the marsh plain (H.T. Harvey & Associates 2015a).

The levees and berms around Outer Faber Marsh are dominated by invasive plant species (about 58 percent cover) comprised mostly of invasive mustard and ice plant; however, the southern levee (Bay levee) contains more suitable native transition zone habitat (*e.g.*, marsh gumplant) than the western levee. The marsh is surrounded by PG&E towers and boardwalks and levees that increase predation risk on salt marsh harvest mice and California clapper rails in Outer Faber Marsh; the boardwalks and levees provide access for mammal predators while the PG&E towers provide perch and nest sites for raptors they may prey upon salt marsh harvest mice and California clapper rails in Outer Faber Marsh and the adjacent Main Faber Marsh. Due to the marsh's exposed location along San Francisco Bay and its lower elevation, Outer Faber Marsh is subject to more frequent tidal flooding and wave fetch than the more protected tidal marsh of Main Faber Marsh to the west. A north-south levee separates Outer Faber Marsh from Main Faber Marsh, while an east-west levee (the Bay levee) separates Outer Faber Marsh from the lower reach of San Francisquito Creek. Outer Faber Marsh provides lower quality breeding, foraging and dispersal habitat for salt marsh harvest mice and California clapper rails due to its exposure to more frequent tidal flooding and wave fetch from the Bay. Vegetation along the Bay levee and the berm separating Outer Faber Marsh from Main Faber Marsh provide transition zone habitat for salt marsh harvest mice and California clapper rails which shelter the mice and the rails from predation during extreme high tide and flooding events when the marsh plain is flooded; however, the quality of the transition zone habitat is low due to the dominance of invasive plant species which are leafless in the winter when the salt marsh harvest mouse and California clapper rail are in most need of suitable cover during the more frequent extreme high tide and winter storm events.

Laumeister Marsh

The Refuge-managed Laumeister Marsh is an approximately 91-acre high quality native tidal marsh located immediately north of Main Faber Marsh. Laumeister Marsh is bounded by the San Francisco Bay Trail levee and a residential neighborhood of the City of East Palo Alto to the west and the Cooley Landing public park to the north. The City of East Palo Alto is currently making improvements to Cooley Landing Park to increase public access and recreational opportunities (Cooley Landing Project). The Service issued a biological opinion for the indirect effects of increased public access at Cooley Landing Park on salt marsh harvest mice and California clapper rails in Laumeister Marsh (Service file number 81420-2011-F-0552-1; Service 2011). The City of East Palo Alto will minimize the indirect effects of increased public access at Cooley Landing Park by implementing a five-year adaptive mammal predator management plan beginning in October 2014 (Huffman-Broadway Group, Inc. 2011).

Diked Marsh Habitat at Palo Alto Municipal Golf Course

There about 2.7 acres of diked marsh habitat within the action area at the Palo Alto Municipal Golf Course adjacent to San Francisquito Creek. The diked marsh habitat within the action area is dominated by pickleweed and Mediterranean barley. The diked marsh habitat and adjacent ruderal grasslands at the Palo Alto Municipal Golf Course provide lower quality breeding, dispersal, and foraging habitat for salt marsh harvest mice. The managed turf of the golf course is not suitable habitat for the salt marsh harvest mouse because the turf grass is actively managed and maintained at a low height unsuitable for providing cover for the salt marsh harvest mouse. The diked marsh habitat within the action area is not suitable habitat for the California clapper rail because it is not tidally influenced.

Ruderal Annual Grassland

There are about 17.5 acres of ruderal annual grassland habitat within the action area along the middle reach of the San Francisquito Creek corridor. The ruderal annual grassland within the action area is dominated by wild oat and ripgut brome. The ruderal annual grassland habitat within the action area that is contiguous with and within 328 feet of suitable tidal salt or brackish marsh habitat along San Francisquito Creek provides suitable foraging and dispersal habitat for the salt marsh harvest mouse (Service 2010). The quality of the ruderal grassland within the action area is degraded by the presence of heavily used trails, abundance of predators in a highly urbanized environment, and frequent mowing.

Salt Marsh Harvest Mouse

Central/South San Francisco Bay Recovery Unit

The action area for the proposed project occurs within the Recovery Plan's Central/South San Francisco Bay Recovery Unit for the salt marsh harvest mouse (Service 2013a). The Central/South San Francisco Bay Recovery Unit is within the range of the southern subspecies of the salt marsh harvest mouse (*R. r. raviventris*) (Service 2013a). The population status of the southern subspecies is more precarious than that of the northern subspecies (*R. r. halicoetes*). Few major, resilient, or secure populations of the southern subspecies of the salt marsh harvest mouse persist within the Central/South San Francisco Bay Recovery Unit. The current populations within this recovery unit are very small and isolated compared with the historical pattern of distribution and abundance of the subspecies. All major population centers of the southern subspecies are remote from one another based on dispersal distances known for the species. Predation by mammalian and avian predators and spread of invasive plant species (*e.g.*, perennial pepperweed) are major threats to salt marsh harvest mice in the Central/South San Francisco Bay Recovery Unit (Albertson 1995, Service 2010, Service 2013a).

Levees adjacent to tidal marsh habitat and PG&E's numerous boardwalks provide access for mammalian predators that may prey on salt marsh harvest mice and California clapper rails in the adjacent marsh. PG&E's numerous transmission towers and transmission lines within tidal marsh habitat in the South Bay provide artificial perches and nesting platforms for raptors (*e.g.*, red-tailed hawks, crows, ravens, northern harriers, peregrine falcons, kestrels, white-tailed kites, gulls, great blue herons, barn owls, short-eared owls, great horned owls) that may prey on salt marsh harvest mice and California clapper rails in the adjacent marshes (Albertson 1995; Olofson Environmental, Inc. 2011a; J. Albertson, Refuge, pers. comm. 2014). Raptors that nest and perch on PG&E's transmission towers and transmission lines in tidal marsh in the South Bay have been observed hunting in tidal marsh habitat known to be occupied by breeding salt marsh harvest mice and California clapper rails (Albertson 1995; Olofson Environmental, Inc. 2011a; J. Albertson, Refuge, pers. comm. 2014). Predation rates increase during extreme high tide events when cover is limited.

The Refuge annually funds the U.S. Department of Agriculture Wildlife Services to control mammalian predators that threaten the salt marsh harvest mouse and California clapper rail on Refuge lands in the South Bay. The priority areas for predator management at the Refuge are Ideal Marsh, Dumbarton Marsh, Mowry Marsh, Main Faber Marsh, and Laumeister Marsh (Refuge 2013). The Refuge, however, lacks the funding to adequately control all mammalian predators that threaten the salt marsh harvest mouse and California clapper rail on Refuge lands in the South Bay (J. Albertson, Refuge, pers. comm. 2014). In 2012, Cargill, Inc. (Cargill) restarted the annual funding of the U.S. Department of Agriculture Wildlife Services for mammalian predator management for the benefit of the salt marsh harvest mouse and California clapper rail for a 10-year period along Cargill's 44 miles of salt pond levees that are adjacent to tidal marsh habitat in the Newark, Mowry, and Redwood City salt pond complexes in the South Bay at the Refuge in Alameda and San Mateo counties. The annual funding of mammalian predator management by Cargill is a condition of the Service's biological opinion on the issuance of a 10-year Corps regional general permit for Cargill's salt pond levee operation and maintenance work in the South Bay (Service file number 81420-2010-F-0519; Service 2012a). The areas where Cargill will be funding mammalian predator management are outside of the action area for the proposed project. The City of East Palo Alto is contributing funding for a five-year mammalian predator management program at Cooley Landing beginning in 2015 adjacent to Laumeister Marsh about 0.5 mile north of Main Faber Marsh (Huffman-Broadway Group, Inc. 2011). The annual funding of mammalian predator management by the City of East Palo Alto is a condition of the Service's biological opinion on the Cooley Landing Project to minimize the effects of increased public use at Cooley Landing (81420-2011-F-0552-1; Service 2011).

The Refuge finalized an avian predator management plan in 2012 for the benefit of the salt marsh harvest mouse, California clapper rail, western snowy plover, and other listed species on its Refuge lands in the South Bay (Refuge 2012). PG&E is currently working with the Refuge to assist in the implementation of the avian predator management plan by responding to the Refuge's requests to remove raptor nests from PG&E transmission towers within habitat for the salt marsh harvest mouse, California clapper rail, western snowy plover, and California least tern. PG&E's assistance with the avian predator management program is a requirement of the Refuge's Special Use Permit, which was renewed in 2013 (E. Mruz, Refuge, pers. comm. 2012; Service file number 81420-2011-F-0592-2; Service 2012b). At the request of the Refuge, PG&E removed 8-10 raptor nests (mostly raven nests and two red-tailed hawk nests) from listed species habitat in 2013 (C. Strong, Refuge, pers. comm. 2014; K. Sawyer, Refuge, *in litt.* 2013). However, the majority of the raptor nest removal conducted by PG&E in 2013 was for the benefit of the western snowy plover rather than the salt marsh harvest mouse and California clapper rail. PG&E removed a red-tailed hawk nest from a PG&E tower near the San Mateo Bridge toll plaza in Alameda County within salt marsh harvest mouse habitat west of Eden Landing Pond 10 in April 2013 (K. Sawyer, Refuge, *in litt.* 2013). No raptor nests were removed from California clapper rail habitat in 2013 (K. Sawyer, Refuge, *in litt.* 2013). Raptor nests (primarily ravens and red-tailed hawks) were removed from PG&E towers at 14 locations within or near tidal marsh habitat for the salt marsh harvest mouse and California clapper rail in the South Bay in 2014 outside of the action area (C. Strong, Refuge, pers. comm.). PG&E removed several ravens' nests at the request of the Refuge from transmission towers near the action area near Faber Marsh in 2015 (R. Tertes, Refuge, 2015). However, the Refuge lacks the resources to adequately monitor all of PG&E's transmission towers for raptor nests (J. Albertson, Refuge, pers. comm. 2014). Therefore, raptor predation facilitated by PG&E transmission towers within tidal marsh habitat continues to be a major threat to salt marsh harvest mice and California clapper rails in the South Bay.

The Refuge finalized a weed management plan in 2013 to control invasive plant species (*e.g.*, perennial pepperweed) that threaten the tidal marsh and upland refugia habitat for the salt marsh harvest mouse and California clapper rail on Refuge lands in the South Bay (Marriott *et al.* 2013). The Refuge, however, lacks the resources to adequately implement its weed management plan (R. Tertes, Refuge, pers. comm. 2013). Cargill will implement the Refuge's weed management plan on the 12,100 acres of Cargill's property within the Newark, Mowry, and Redwood City salt pond complexes as a condition of the Service's biological opinion on the issuance of a 10-year Corps regional general permit for Cargill's salt pond levee operation and maintenance work in the South Bay (Service file number 81420-2010-F-0519; Service 2012a); the weed management that will be conducted by Cargill is outside of the action area for SFCJPA's proposed project.

Habitats within the Action Area

The expansive tidal marshes within the action area within Main Faber Marsh and the adjacent Laumeister Marsh provide high quality breeding, foraging, and dispersal habitat for salt marsh harvest mice. Outer Faber Marsh provides lower quality breeding habitat for the salt marsh harvest mouse since the tidal marsh is at a lower elevation and more exposed to tidal flooding and wave fetch due to its exposed location along San Francisco Bay. Potential breeding habitat for the salt marsh harvest mouse in Outer Faber Marsh is limited to the mid-elevation pickleweed marsh near the southern and western berms. Salt marsh harvest mice may also breed, forage, and disperse through the diked marsh habitat at the Palo Alto Municipal Golf Course near San Francisquito Creek. Salt marsh harvest mice are unlikely to utilize the managed turf of the adjacent golf course because it is actively managed, and the vegetation is maintained at a low height and thus does not provide suitable cover for the mouse.

The fringe of tidal marsh along the lower reach of San Francisquito Creek (downstream of Friendship Bridge) (Figure 1) provides moderate quality breeding, foraging, and dispersal habitat for salt marsh harvest mice; the suitability of this marsh for the salt marsh harvest mouse is reduced by frequent inundation of the marsh during winter storms. The fringe of tidal and brackish marsh along the middle reach of San Francisquito Creek (between Friendship Bridge and Daphne Way/Geng Road) (Figure 1) provides low quality breeding, foraging, and dispersal habitat for the salt marsh harvest mouse due to the marsh's sparse vegetative cover, frequent inundation during winter storms, the fragmented nature of the habitat, the presence of invasive plant species (*e.g.*, perennial pepperweed) and avian and mammal predators and frequent disturbance by trail users. The ruderal annual grassland habitat that is contiguous with and within 328 feet of the tidal and brackish marsh of the middle reach of San Francisquito Creek provides low quality foraging and dispersal habitat for the salt marsh harvest mouse. The marsh along the upper reach of San Francisquito Creek (Daphne Way/Geng Road to Highway 101) (Figure 1) is unsuitable for the salt marsh harvest mouse because it is less tidally influenced, has sparse vegetative cover, is frequently inundated during winter storms, highly fragmented, and located within a highly urbanized environment degraded by the presence of invasive plant species and avian and mammal predators.

Transition zone habitat along the levees and berms of Main Faber Marsh, Laumeister Marsh, San Francisquito Creek, and Outer Faber Marsh provide upland refugia cover for the salt marsh harvest mouse during extreme high tide and flooding events when the marsh plain is inundated. However, the quality of the transition zone habitat within the action area is low due to a lack of suitable canopy structure because the existing vegetation is dominated by invasive plant species, low-growing perennials, frequent bare patches, and monotypic patches of annual plants (*e.g.*, black mustard) (H.T. Harvey & Associates 2015a). Without suitable upland refugia cover, the salt marsh harvest mouse is more vulnerable to predation during extreme high tide and flooding events. Recent studies of the movement of the northern subspecies of salt marsh harvest mouse during extreme high tide events in tidal marsh in Suisun Bay found that the majority of the salt marsh harvest mice stayed in the marsh and climbed tall emergent vegetation to escape flood waters instead of moving horizontally into upland habitats along levees (Smith *et al.* 2014). Thus Smith *et al.* (2014) stressed the importance of tall emergent vegetation within the marsh to provide high tide refugia cover. However, the authors added that upland habitats along levees may be more important as high tide refugia cover to the southern subspecies of salt marsh harvest mouse in the South Bay due to the shorter heights of the marsh vegetation and the narrower widths of the marshes.

Occurrences near the Action Area

There are no known recent surveys of salt marsh harvest mouse that have been conducted within the action area. However, there are several reports of salt marsh harvest mice occurring near the action area. The San Francisco Estuary Institute (http://www.sfei.org/content/salt-marsh-harvest-mouse-database-and-maps) and California Natural Diversity Database (CNDDB; CDFW 2015) report the following salt marsh harvest mouse survey data within 0.5 mile of the action area for the proposed project:

1. Two hundred forty salt marsh harvest mice captured in tidal marsh habitat of the Palo Alto Baylands about 0.25 mile southeast of the action area during 2,050 trapping nights in 1972 (capture efficiency (CE) = 9.56) (site number 240; Wondolleck, unpubl. data, 1972);

2. Five salt marsh harvest mice captured in tidal marsh habitat of the Palo Alto Baylands about 0.25 mile southeast of the action area during 480 trapping nights in 1993 (CE = 1.04) (site number 502; Steinberg, unpubl. data, 1993);

3. One salt marsh harvest mouse captured in tidal marsh habitat of the Palo Alto Baylands about 0.25 mile southeast of the action area during 200 trapping nights in 1980 (CE = 0.5) (site number 91; Service, unpubl. data, 1980);

4. One salt marsh harvest mouse captured in tidal marsh habitat at the northern edge of the Laumeister Tract of the Refuge about 0.5 mile north of the action area during 800 trapping nights in 1990 (CE = 0.13) (site number 232; H.T. Harvey and Associates, unpubl. data, 1990); and

5. Twelve adult salt marsh harvest mice found in the Laumeister Tract of the Refuge south of Bay Road about 0.5 mile north of the action area in January 1991 (CNDDB occurrence number 131, CDFW 2015).

There is no recent survey data available for salt marsh harvest mice near the action area since 1993. However, a biological monitor for the City of East Palo Alto's Cooley Landing Project (Service file number 81420-2011-F-0552-1; Service 2011) reported the observation of a potential salt marsh harvest mouse nest during vegetation removal activities at Cooley Landing along the northern edge of Laumeister Marsh in November 2011. The biological monitor, however, could not find the nest during surveys of the area weeks later likely due to the nest being flooded during an extreme high tide event that month (R. Perrera, Huffman-Broadway Group, Inc., pers. comm. 2012). Mice were also observed recently during vegetation removal within diked brackish marsh habitat immediately west of Main Faber Marsh in October 2014 for the Runnymede Storm Drainage Improvements Phase II and O'Connor Pump Station Outfall Structure Repair Project (Service file number 81420-2011-F-0103-2); however, the biological monitor was not able to determine whether the mice were salt marsh harvest mice (K. Allan, WRA Environmental Consulting, pers. comm. 2014).

Based on the known occurrence of the salt marsh harvest mouse near the action area and the availability of suitable habitat, the Service believes the salt marsh harvest mouse is likely to be present within all suitable tidal marsh, brackish marsh, diked marsh, and adjacent upland habitats (within 328 feet of suitable marsh habitat) throughout the action area within Main Faber Marsh, Outer Faber Marsh, Laumeister Marsh, along the lower and middle reaches of San Francisquito Creek, and the diked marsh habitat at the Palo Alto Municipal Golf Course near San Francisquito Creek.

<u>California Clapper Rail</u>

Central/South San Francisco Bay Recovery Unit

The action area for the proposed project occurs within the Recovery Plan's Central/South San Francisco Bay Recovery Unit for the California clapper rail (Service 2013a). The Central/South San Francisco Bay Recovery Unit supports the majority of California clapper rail populations. Populations in this unit are widely separated from northern ones, but there may be occasional dispersal between these areas. Predation by mammalian and avian predators is one of the primary threats to California clapper rails in the Central/South San Francisco Bay Recovery Unit (Albertson 1995, Service 2013a, Overton *et al.* 2014).

Levees adjacent to tidal marsh habitat and PG&E's numerous boardwalks provide access for mammalian predators that may prey on California clapper rails in the adjacent marsh. PG&E's numerous transmission towers and transmission lines within tidal marsh habitat in the South Bay provide artificial perches and nesting platforms for raptors (*e.g.*, red-tailed hawks, crows, ravens, northern harriers, peregrine falcons, kestrels, white-tailed kites, gulls, great blue herons, barn owls, short-eared owls, great horned owls) that may prey on California clapper rails in the adjacent marshes (Albertson 1995; Olofson Environmental, Inc. 2011; Overton *et al.* 2014; J. Albertson, Refuge, pers. comm. 2012). Raptors that nest and perch on PG&E's transmission towers and transmission lines in tidal marsh in the South Bay have been observed hunting in tidal marsh habitat known to be occupied by breeding California clapper rails (Albertson 1995; Olofson Environmental, Inc. 2011; J. Albertson, Refuge, pers. comm. 2012). Predation rates increase during extreme high tide events when cover is limited.

Overton *et al.* (2014) tracked 108 radio-marked California clapper rails at four marshes within the Central/South San Francisco Bay Recovery Unit (*i.e.*, Colma Marsh, Arrowhead Marsh, Laumeister

Marsh, and Cogswell Marsh) and estimated survival rates over 166 weeks between 2007 and 2009. Overton *et al.* (2014) found that most of the California clapper rails (53 percent) died due to predation with raptors depredating 30 individual California clapper rails (28 percent) and mammals depredating 27 individual California clapper rails (25 percent). Seasonal risk of mortality was more than twice as great in the winter than in other seasons (Overton *et al.* 2014). The mortality rate of California clapper rails increased during periods of greater tidal inundation in all four marshes studied, but the impact of tide level was greatest in the winter when senesced vegetation reduced available refuge cover (Overton *et al.* 2014). The annual survival rate for California clapper rails at Laumeister Marsh was 0.227 (Overton *et al.* 2014). Preliminary data from the U.S. Geological Survey shows that predation by avian predators followed by feral cats are the primary causes of mortality of the California clapper rail within Main Faber Marsh (C. Overton, U.S. Geological Survey, pers. comm. 2015).

The Refuge's goal for predator management at the Refuge is to increase California clapper rail population densities to 2.96 rails per acre (Refuge 2013). However, the Refuge lacks the resources to adequately control all mammalian and avian predators that threaten the California clapper rail (J. Albertson, Refuge, pers. comm. 2014). See the discussion above for the salt marsh harvest mouse regarding the implementation of mammalian and avian predator control and a weed management plan at the Refuge and within the Central/South San Francisco Bay Recovery Unit. No raptor nests were removed from PG&E towers within California clapper rail habitat in 2013 (K. Sawyer, Refuge, *in litt.* 2013). Raptor nests (primarily ravens and red-tailed hawks) were removed from PG&E towers at 14 locations in the South Bay within or near tidal marsh habitat for the California clapper rail in 2014 (C. Strong, Refuge, pers. comm.); however, no raptor nest removal occurred within the action area in 2014. PG&E removed several ravens' nests at the request of the Refuge from transmission towers near the action area near Faber Marsh in 2015 (R. Tertes, Refuge, 2015). The Refuge lacks the resources to adequately monitor all of PG&E's transmission towers for raptor nests (J. Albertson, Refuge, pers. comm. 2014). Therefore, raptor predation facilitated by PG&E transmission towers within tidal marsh habitat continues to be a major threat to California clapper rails in the South Bay.

Occurrences within the Action Area

The Refuge-managed 81.5-acre Main Faber Marsh and adjacent Laumeister Marsh contain very high quality expansive tidal marsh habitat for the California clapper rail and support one of the largest populations of the California clapper rail range-wide. Main Faber Marsh and the adjacent Laumeister Marsh accounted for about 3.8 percent of the estimated total range-wide population of the California clapper rail in 2009-2011 (Liu *et al.* 2012; L. Liu, Point Blue Conservation Science, pers. comm. 2014). Main Faber Marsh also has one of the highest population densities of the California clapper rail range-wide (Liu *et al.* 2012; L. Liu, Point Blue Conservation Science, pers. comm. 2014). There were a total of about 91 California clapper rails detected in Main Faber Marsh and Laumeister Marsh in 2012 and 94 in 2011 during the highest minimum count (Point Blue Conservation Science 2014). However, the total number of California clapper rail detections within Main Faber Marsh and Laumeister Marsh significantly declined in 2013 with only 50 California clapper rails detected during the highest minimum count (Point Blue Conservation Science 2014). Main Faber Marsh had the most significant decline in California clapper rail detections with between 57 and 62 California clapper rails detected in 2010, between 64 and 85 California clapper rails detected in 2011, and only 25 California clapper rails detected in 2013 (PRBO Conservation Science 2012, Point Blue Conservation Science 2014). The number of California clapper rail detections within the adjacent Laumeister Marsh was 30 in 2011, 22 in 2012, and 25 in 2013 (PRBO Conservation Science 2012, Point Blue Conservation Science 2014).

Two California clapper rails were detected during protocol-level surveys in Outer Faber Marsh in 2011, two in 2013, and three in 2013 (Point Blue Conservation Science, *in litt.* 2014). Outer Faber Marsh provides lower quality habitat for the California clapper rail than Main Faber Marsh because the marsh is more sparsely vegetated, at a lower and more exposed location along San Francisco Bay, and subject to more frequent inundation from daily tides and wave fetch from the Bay. Although a few California clapper rails have been observed during protocol-level surveys within Outer Faber Marsh, it is not known if the rails successfully breed within Outer Faber Marsh.

Protocol-level surveys conducted along San Francisquito Creek detected two California clapper rails along the lower reach of the creek in 2011 and one in 2013 (PRBO Conservation Science 2012; Point Blue Conservation Science, *in litt.* 2014). California clapper rails likely forage and disperse along lower San Francisquito Creek, but it is not known if they successfully breed in the fringe of tidal marsh along lower San Francisquito Creek.

It is not known with certainty why the number of California clapper rails in Main Faber Marsh declined in 2013, but the Service believes it may be due to high levels of predation (Overton *et al.* 2014; J. McBroom, Olofson Environmental, pers. comm. 2014; J. Albertson, Refuge, pers. comm. 2014; E. Mruz, Refuge, pers. comm. 2014). The Refuge through the U.S. Department of Agriculture Wildlife Services has implemented minimal amounts of mammalian predator management within Main Faber Marsh and Laumeister Marsh in recent years due to limited funding (E. Mruz, Refuge, pers. comm. 2014; J. Albertson, Refuge, pers. comm. 2014). Studies in 2007 through 2009 showed high rates of predation in the adjacent Laumeister Marsh by both avian and mammal predators with 53 percent of California clapper rails depredated during the 166-week study period (Overton *et al.* 2014). Studies of predation in Laumeister Marsh in the 1990s showed that Norway rats depredated about half of the California clapper rail nests (Albertson 1995). The Refuge believes that Norway rats are likely still a significant source of predation within Main Faber Marsh and Laumeister Marsh because the U.S. Department of Agriculture Wildlife Services is unable to control the rat populations coming from the nearby residential communities in the City of East Palo Alto (J. Albertson, Refuge, pers. comm. 2014). The City of East Palo Alto is required under the biological opinion for the Cooley Landing Project to fund five years of mammalian predator management within Laumeister Marsh (Service file number 81420-2011-F-0552-1, Service 2011); the five-year predator management program at Laumeister Marsh was initiated in October 2014 (B. Popper, U.S. Department of Agriculture Wildlife Services, pers. comm. 2015).

Raptor predation is also likely a significant source of mortality of California clapper rails within the Main Faber Marsh, Laumeister Marsh, and Outer Faber Marsh (C. Overton, U.S. Geological Survey, pers. comm. 2015). Northern harriers and red-tailed hawks have been observed nesting in Main Faber Marsh and Laumeister Marsh and are likely to prey on California clapper rails within the action area (J. Albertson, Refuge, pers. comm. 2014). Raptor predation within Main Faber Marsh, Laumeister Marsh, and Outer Faber Marsh is facilitated by PG&E transmission towers and transmission lines within the marshes that provide artificial perch and nest sites for raptors. Avian predator management had not been implemented within the action area until 2015 when several ravens' nests were removed from transmissions towers by PG&E at the request of the Refuge (R. Tertes, Refuge, pers. comm. 2015). As stated previously, recent studies of the sources of mortality of California clapper rails within Laumeister Marsh and other marshes of the Central/South San

Francisco Bay Recovery Unit found that 53 percent of California clapper rails died due to predation with raptors depredating 28 percent and mammals depredating 25 percent of California clapper rails (Overton *et al.* 2014). Thus predation by mammal and avian predators are likely significant contributors to the recent decline in the number of California clapper rails within Main Faber Marsh.

Based on the known occurrence of the California clapper rail within the action area in Main Faber Marsh, Laumeister Marsh, Outer Faber Marsh, and lower San Francisquito Creek and the availability of suitable habitat, the Service considers the California clapper rail to have a high potential to occur within all suitable tidal marsh habitat and adjacent transition zone habitat within the action area in Main Faber Marsh, Laumeister Marsh, Outer Faber Marsh, and the lower reach San Francisquito Creek (downstream of Friendship Bridge). Individual California clapper rails may infrequently forage and disperse within the middle reach of San Francisquito Creek immediately upstream of Friendship Bridge; however, no California clapper rails have been observed upstream of Friendship Bridge during protocol-level surveys. California clapper rails are unlikely to occur within the upper reach of San Francisquito Creek (upstream of Dahpne Way/Geng Road) because this portion of the creek is less tidally influenced, sparsely vegetated, the marsh is highly fragmented, and located within a highly urbanized environment with an abundance of mammal and avian predators. California clapper rails are unlikely to occur within the diked marsh habitat at the Palo Alto Golf Course because this marsh is not tidally influenced.

Effects of the Proposed Project

Salt Marsh Harvest Mouse and California Clapper Rail

Habitat Disturbance

Table 3 below summarizes for each habitat type the acres and linear extent of suitable habitat for the salt marsh harvest mouse and California clapper rail that will be temporarily disturbed or permanently lost due to construction of the proposed project. Table 4 below summarizes the changes in the areal extent of each habitat type for the salt marsh harvest mouse and California clapper rail within the action area post-construction of the proposed project. Table 5 below summarizes the amount of tidal marsh habitat that will be temporarily disturbed during the installation of the five high-tide refuge islands in Outer Faber Marsh.

Salt Marsh Harvest Mouse

The proposed project will result in the temporary disturbance of a total of about 3.83 acres of tidal marsh habitat, 1.89 acres of diked marsh habitat, 13.05 acres of ruderal grassland habitat, and 8.12 acres of upland refugia/transition zone habitat for the salt marsh harvest mouse (Table 3). The proposed project will result in the permanent loss of a total of about 0.82 acre of tidal marsh habitat, 0.79 acre of diked marsh habitat, 7.77 acres of ruderal grassland habitat, and 0.27 acre of upland refugia/transition zone habitat for the salt marsh harvest mouse (Table 3). The proposed project will result in a net gain of about 6.90 acres of suitable tidal marsh habitat for the salt marsh harvest mouse within the widened San Francisquito Creek floodplain channel (Table 3). The proposed project will result in a net loss of about 1.61 acres of lower quality diked marsh habitat adjacent to the golf course (Table 3). The proposed project will result in a net loss of about 6.12 acres of upland foraging/dispersal habitat for the salt marsh harvest mouse primarily due to ongoing mowing

Table 3. Habitat loss and disturbance.

Habitat Type	Temporary Disturbance		Permanent Loss	
	Acres	Linear Feet[1]	Acres	Linear Feet[1]
Salt Marsh Harvest Mouse Only				
Tidal Marsh	2.07	n/a	0.46	n/a
Diked Marsh	1.89	n/a	0.79	n/a
Ruderal Grassland				
Construction	13.05	n/a	1.28	n/a
Ongoing O&M (levee mowing)[2]	0.00	n/a	6.49	n/a
Salt Marsh Harvest Mouse Only Subtotal	**17.01**	n/a	**9.02**	n/a
Salt Marsh Harvest Mouse and California Clapper Rail				
Tidal Salt Marsh				
Main Faber Marsh Southern Levee	0.32	475	0.30	598
Bay Levee	0.40	636	0.00	0
Bay Levee access	0.00	0	0.00	0
Outer Faber High-Tide Refugia Islands[3]	0.19	n/a	0.00	n/a
All other construction (creek channel)	0.85	n/a	0.06	n/a
Tidal Salt Marsh Subtotal	1.76	n/a	0.36	n/a
Upland Refugia/Transition Zone				
Main Faber Marsh Southern Levee[4]	1.03	1,018	0.27	488
Transition Zone Habitat Enhancement[4]	5.66	5,120	0.00	n/a
Bay Levee	0.93	651	0.00	0
Bay Levee access[4]	0.44	1,150	0.00	0
All other construction (creek channel)	0.06	n/a	0.00	n/a
Upland Refugia/Transition Zone Subtotal	8.12	n/a	0.27	n/a
Salt Marsh Harvest Mouse and California Clapper Rail Subtotal	**9.88**	n/a	**0.63**	n/a
GRAND TOTAL	**26.89**	n/a	**9.65**	n/a

[1] Linear footage of disturbance is only reported for effects incurred from construction of the Main Faber Marsh levee, Bay levee lowering, access, and levee habitat enhancement along the Main Faber Marsh and Outer Faber Marsh levees (n/a = not applicable).

[2] Ongoing O&M effects from annual mowing of grassland habitat along the levees is counted as a permanent effect. However, salt marsh harvest mouse forage and dispersal habitat will be present, especially seasonally between mowing events, when vegetation is taller.

[3] High-tide refuge islands will likely establish as jurisdictional wetlands (*i.e.*, tidal marsh) with wetland plant palette and saturated subsoils. The 0.19 acre of marsh disturbance will be temporary.

[4] A total of about 5,120 linear feet of habitat will be disturbed during transition zone enhancement along the northern, eastern, and southern Main Faber Marsh levees including 1,540 linear feet of the southern levee which partially overlaps with the 1,018 linear feet of disturbance from construction along the southern levee. However, the 5.66-acre estimate for transition zone enhancement does not include the impacts from construction activities along the southern levee.

Table 4. Post-construction changes in the areal extent of suitable habitat within the action area.

Habitat Type	Post-Construction Surface Area (acres)	Net Gain or Loss (acres)	Habitat Enhanced[2] (acres)
California Clapper Rail and Salt Marsh Harvest Mouse			
Tidal Marsh[1]	3.07	+1.09	n/a
Upland Refugia/Transition Zone[2]	7.83	+1.64	5.66[2]
Salt Marsh Harvest Mouse Only			
Tidal Marsh[1]	8.34	+5.81	n/a
Diked Marsh	1.06	-1.61	n/a
Upland Foraging/Dispersal[3] (Ruderal Grassland)	14.70	-6.12[3]	n/a

[1] Tidal marsh along the lower reach of San Francisquito Creek downstream of Friendship Bridge is counted as suitable habitat for both California clapper rail and salt marsh harvest mouse. Tidal marsh along the middle reach of San Francisquito Creek between Friendship Bridge and the ends of Geng Road and Daphne Way is counted as suitable habitat only for salt marsh harvest mouse (although there is the potential for California clapper rails to infrequently forage and disperse upstream of Friendship Bridge). Tidal marsh along the upper reach of San Francisquito Creek upstream of the ends of Geng Road and Daphne Way are not counted as suitable habitat for the California clapper rail or salt marsh harvest mouse.

[2] The enhancement of 5.66 acres of upland refugia/transition zone habitat along the southern, northern, and eastern levees of Main Faber Marsh and the western levee of Outer Faber Marsh through invasive plant control and planting suitable native transition zone plant species (n/a = not applicable).

[3] The ongoing disturbance of 6.49 acres of grassland habitat from annual levee mowing is counted as a net loss of habitat; however, the grassland will be available as salt marsh harvest mouse foraging and dispersal habitat in between mowing events, especially during the wet season. Some potential upland foraging/dispersal habitat would be created on the new levee on the Palo Alto side due to the increase in surface area of the levee on the Palo Alto side post-construction.

Table 5. Total maximum amount of tidal marsh habitat temporarily disturbed during installation of five high tide refuge islands in Outer Faber Marsh (copied from Table 5 in H.T. Harvey & Associates (2015a)).

Cause of Disturbance	Total Maximum Disturbance for Five Refuge Islands (square feet (acres))	Expected Duration of Recovery
Place plywood pathway and transport crew and materials through marsh habitat to access refuge islands construction locations	5,000 square feet (0.11 acre)	Marsh vegetation will fully recover within a few days-weeks after plywood is removed
Place plywood in approximately a 10-foot radius surrounding refuge islands to protect the construction area	2,000 square feet (0.05 acre)	Marsh vegetation will fully recover within a few weeks after plywood is removed
Refuge island construction (sod removed and then placed on island)	1,250 square feet (0.03 acre)	Marsh vegetation will fully recover 6 months - 1 year after refuge island construction
TOTAL	**8,250 square feet (0.19 acre)**	

of 6.49 acres of grassland on the levee side slopes along the San Francisquito Creek channel for O&M; the Service considers the annual mowing (up to three times per year during the summer and fall) of the grassland habitat to 3 or 4 inches high along the levee side slopes for O&M a net loss of habitat although the grassland would provide foraging and dispersal cover for the salt marsh harvest mouse in between mowing events particularly during the wet season (Table 3). The proposed project will result in a net gain of about 1.64 acres of upland refugia/transition zone habitat primarily along the widened San Francisquito Creek channel. An additional 5.66 acres of low quality upland refugia/transition zone habitat for the salt marsh harvest mouse will be enhanced along a total of about 5,120 linear feet of the southern, northern, and eastern Main Faber Marsh perimeter levees and Outer Faber Marsh western perimeter levee through control of invasive plant species (*e.g.*, mustard, ice plant, and perennial pepperweed) and planting suitable native transition zone plant species (*e.g.*, marsh gumplant) (Figure 4 and Table 4). The proposed project will also create upland refugia/transition zone habitat for the salt marsh harvest mouse within Outer Faber Marsh through the installation of five 10-foot-wide by 30-foot-long high-tide refuge islands at the elevation of MHHW (Figures 3, 4, and 5).

Tidal salt marsh habitat will be disturbed during stabilizing and filling in low spots in the Main Faber Marsh levee, degrading the Bay levee, excavating and widening the lower and middle reaches of the San Francisquito Creek channel, constructing the floodwalls along the middle reach of San Francisquito Creek, and creation of the five high-tide refuge islands in Outer Faber Marsh (Tables 3 and 5). The stabilizing and filling in low spots in the Main Faber Marsh levee will temporarily disturb about 0.32 acre and permanently remove about 0.30 acre of high quality tidal marsh habitat the salt marsh harvest mouse utilizes for breeding, foraging, sheltering, and dispersal (Table 5).

However, the quality of the tidal marsh habitat that will be temporarily disturbed (2.92 acres) or permanently removed (0.52 acre) along the lower and middle reaches of San Francisquito Creek is low due to frequent inundation during high tides and winter storms, presence of invasive plant species and predators, and habitat fragmentation. The quality of the tidal marsh habitat that will be temporarily disturbed (0.59 acre) within Outer Faber Marsh during degrading the Bay levee and installation of the high tide refuge islands is low due to the marsh's lower elevation and exposure to frequent flooding and wave fetch from the adjacent San Francisco Bay.

The stabilizing and filling in low spots in the Main Faber Marsh levee and accessing and degrading the Bay levee will also temporarily disturb about 2.40 acres and permanently remove about 0.27 acre of low quality upland refugia/transition zone habitat the salt marsh harvest mouse primarily utilizes for sheltering during extreme high tide and flooding events when the adjacent marsh plain is flooded. The quality of the upland refugia/ transition zone habitat along the Main Faber Marsh levee and Bay levee that will be disturbed is low due to the dominance of invasive plant species like mustard and perennial pepperweed which provide poor quality high tide refugia cover because these invasive plants are leafless in the winter.

The widening of the San Francisquito Creek channel and construction of the floodwalls will temporarily disturb about 1.89 acres and permanently remove about 0.79 acre of low quality diked marsh habitat adjacent to the golf course the salt marsh harvest mouse utilizes primarily for foraging and dispersal. The annual mowing (up to three times per year) of 6.49 acres of grassland along the San Francisquito Creek levee side slopes to 3 or 4 inches high during the summer and fall will continue to remove low quality upland habitat the salt marsh harvest mouse utilizes for foraging and dispersal; however, the grassland would provide suitable foraging and dispersal habitat in between mowing events particularly during the wet season.

SFCJPA and SCVWD will minimize the potential for the contamination of suitable tidal marsh habitat during construction of the proposed project by implementing a SWPPP, water quality protection BMPs, and a hazardous spill prevention plan.

The proposed project will compensate for the disturbance of salt marsh harvest mouse habitat by creating an additional approximately 6.90 acres of suitable tidal marsh habitat and 1.64 acres of suitable upland refugia/transition zone habitat for the salt marsh harvest mouse within the widened San Francisquito Creek channel resulting in a total of about 11.41 acres of suitable restored tidal marsh habitat and 7.83 acres of suitable upland refugia/transition zone habitat within the widened creek channel (Table 4). The created and restored tidal marsh and transition zone habitat will be restored under a Service-approved revegetation and monitoring plan with success criteria and invasive plant species control to ensure the tidal marsh and transition zone habitat revegetate with suitable native tidal marsh and transition zone plant species. The created and restored tidal marsh habitat within the widened San Francisquito Creek channel will provide higher quality breeding, foraging, and dispersal habitat for the salt marsh harvest mouse than the narrow and fragmented tidal marsh habitat that currently occurs along the creek channel; however, salt marsh harvest mouse within the tidal marsh along the creek channel would continue to be subject to frequent inundation during high tide and winter storm events. The proposed project will minimize the effects of the net loss of 6.12 acres of upland foraging/dispersal habitat and 1.61 acres of diked marsh habitat for the salt marsh harvest mouse by enhancing a total of approximately 5.66 acres (5,120 linear feet) of upland refugia/transition zone habitat for the salt marsh harvest mouse along the southern, northern, and eastern perimeter levees of Main Faber Marsh and the western levee of Outer Faber

Marsh (Figure 6) under a Service-approved restoration plan. Salt marsh harvest mice within the adjacent Laumeister Marsh will also benefit from the upland refugia/transition zone habitat along the levee that divides northern Main Faber Marsh and southern Laumeister Marsh. All temporarily disturbed habitats within the action area will be restored under a five-year Service-approved revegetation and monitoring plan with invasive plant species control and success criteria.

California Clapper Rail

The proposed project will result in the temporary disturbance of a total of about 1.76 acres of tidal marsh habitat and 8.12 acres of upland refugia/transition zone habitat for the California clapper rail (Table 3). The proposed project will result in the permanent loss of a total of about 0.36 acre of tidal marsh habitat and 0.27 acre of upland refugia/transition zone habitat for the California clapper rail (Table 3). The proposed project will result in a net gain of about 1.09 acres of suitable tidal marsh habitat for the California clapper rail within the widened San Francisquito Creek floodplain channel immediately downstream of Friendship Bridge (Table 4). The proposed project will also result in a net gain of about 1.64 acres of upland refugia/transition zone habitat for the California clapper rail primarily along the widened San Francisquito Creek channel downstream of Friendship Bridge (Table 4). Although upland refugia cover will be removed from Outer Faber Marsh during the Bay levee degrade, the creation of five high-tide refuge islands within Outer Faber Marsh will minimize the effects of the loss of upland refugia in Outer Faber Marsh (Figures 3, 4, and 5).

Tidal salt marsh habitat will be disturbed during stabilizing and filling in low spots in the Main Faber Marsh levee, accessing and degrading the Bay levee, excavating and widening the lower reach of the San Francisquito Creek channel, and installation of the five high-tide refuge islands in Outer Faber Marsh. The stabilizing and filling in low spots in the Main Faber Marsh levee will temporarily disturb about 0.32 acre and permanently remove about 0.30 acre of high quality tidal marsh habitat the California clapper rail utilizes for breeding, foraging, sheltering, and dispersal. However, the quality of the tidal marsh habitat that will be temporarily disturbed (0.85 acres) or permanently removed (0.06 acre) along the lower reach of San Francisquito Creek and the Bay levee (0.40 acre temporarily disturbed) is low due to frequent inundation during high tides and winter storms, presence of invasive plant species and predators, and habitat fragmentation. The excavation of sediment from the lower and middle reaches of the San Francisquito Creek channel will temporarily remove benthic invertebrate prey species for the California clapper rail. However, the benthic invertebrate prey community is likely to recover within a few months to a few years of excavation. Additionally, the widening of the San Francisquito Creek channel will result in an increase in the availability of foraging habitat for the California clapper rail.

The stabilizing and filling in low spots in the Main Faber Marsh levee will also temporarily disturb about 1.03 acres (1,018 linear feet) and permanently remove about 0.27 acre (488 linear feet) of low quality upland refugia/transition zone habitat the California clapper rail primarily utilizes for sheltering during extreme high tide and flooding events when the adjacent marsh plain is flooded. The quality of the upland refugia/ transition zone habitat along the Main Faber Marsh levee that will be disturbed is low due to the dominance of invasive plant species like mustard and perennial pepperweed which provide poor quality high tide refugia cover because these invasive plants are leafless in the winter.

SFCJPA and SCVWD will minimize the potential for the contamination of suitable tidal marsh habitat during construction of the proposed project by implementing a SWPPP, water quality protection BMPs, and a hazardous spill prevention plan.

The proposed project will compensate for the disturbance of California clapper rail habitat by creating an additional approximately 1.09 acres of suitable tidal marsh habitat and 1.64 acres of suitable upland refugia/transition zone habitat for the California clapper rail within the widened San Francisquito Creek channel resulting in a total of about 3.07 acres of suitable restored tidal marsh habitat and 7.83 acres of suitable upland refugia/transition zone habitat within the widened creek channel downstream of Friendship Bridge (Table 4). The created and restored tidal marsh and upland refugia/transition zone habitat will be restored under a Service-approved revegetation and monitoring plan with success criteria and invasive plant species control to ensure the tidal marsh and transition zone habitat revegetate with suitable native tidal marsh and transition zone plant species. The created tidal marsh and upland refugia/transition zone habitat within the widened San Francisquito Creek channel will provide higher quality breeding, foraging, sheltering, and dispersal habitat for the California clapper rail than the fragmented tidal marsh and transition zone habitat that currently occurs along the creek channel; however, California clapper rails within the tidal marsh along the creek channel would continue to be subject to frequent inundation during high tide and winter storm events. The proposed project will minimize the effects of the temporary disturbance of 2.40 acres and permanent loss of 0.27 acre of upland refugia/transition zone habitat for the California clapper rail in Main Faber Marsh and Outer Faber Marsh by enhancing a total of approximately 5.66 acres (5,120 linear feet) of upland refugia/transition zone habitat for the California clapper rail along the southern, northern, and eastern levees of Main Faber Marsh and the western levee of Outer Faber Marsh (Figure 6) under a Service-approved restoration plan. California clapper rails within the adjacent Laumeister Marsh will also benefit from the upland refugia/transition zone habitat along the levee that divides northern Main Faber Marsh and southern Laumeister Marsh. All temporarily disturbed habitats within the action area will be restored under a five-year Service-approved revegetation and monitoring plan with invasive plant species control and success criteria.

Direct Effects to Individuals

Any salt marsh harvest mice occurring within the proposed project area during excavation and levee construction activities could be injured or killed by being crushed by the use heavy equipment within suitable wetland and grassland habitat. Any salt marsh harvest mice occurring within the grassland habitat on the levee side slopes during annual levee mowing (up to three times per year) along the San Francisquito Creek channel could be injured or killed by the mower. Individual salt marsh harvest mice and California clapper rails may be displaced by noise and vibrations associated with construction activities and the operation of heavy equipment within and adjacent to suitable marsh habitat. Displaced salt marsh harvest mice and California clapper rails may have to compete for resources in occupied habitat, and may be more vulnerable to predators. Disturbance to female salt marsh harvest mice may cause abandonment or failure of the current litter. Thus, displaced salt marsh harvest mice may suffer from increased predation, competition, mortality, and reduced reproductive success. SFCJPA and SCVWD will avoid construction activities within 700 feet of California clapper rails during the rail's breeding season; therefore, no breeding California clapper rails will be disturbed during the construction of the proposed project. All work will stop if a salt marsh harvest mouse or its nest is observed within the work area.

The level of disturbance of individual salt marsh harvest mice and California clapper rails may vary depending on the type of equipment being used; different pieces of equipment have different noise levels and, thus, cause more or less disturbance. Noise and vibrations may result in displacement of salt marsh harvest mice and California clapper rails from protective cover and their territories. These disturbances are likely to disrupt normal behavior patterns of breeding, foraging, sheltering, and dispersal. The level of disturbance of salt marsh harvest mice and California clapper rails would be exacerbated if construction activities near tidal areas occurred during an extreme high tide event when the mice and rails escape the flooded marsh to seek high tide refugia cover that is not submerged; this is when the salt marsh harvest mouse and California clapper rail are most vulnerable to predation.

SFCJPA and SCVWD will minimize the potential for injury and mortality of salt marsh harvest mice and reduce the level of harassment by removing vegetation within a 4-foot buffer around work areas using only non-mechanized hand tools and installing salt marsh harvest mouse-proof exclusion fencing around work areas prior to the initiation of work within suitable habitat. The hand removal of vegetation and installation of salt marsh harvest mouse-proof exclusion fencing will be supervised by a Service-approved biological monitor. A Service-approved biological monitor will be onsite during all construction activities within or adjacent to potential habitat for the salt marsh harvest mouse and California clapper rail. Prior to construction activities, environmentally sensitive areas will be flagged or fenced in order to clearly delineate the extent of the construction. A worker awareness program will be presented to all construction personnel before they start work on the proposed project; the program will summarize relevant laws and regulations that protect biological resources, discuss sensitive habitats and listed species with the potential to occur in the work zone, explain the role and authority of the biological monitors, and review applicable avoidance measures to protect listed species and habitats.

SFCJPA and SCVWD will minimize the level of harassment of salt marsh harvest mice and California clapper rails during extreme high tide events by avoiding work within 50 feet of suitable tidal marsh habitat within two hours before and after an extreme high tide event (6.5 feet or higher measured at the Golden Gate Bridge and adjusted to the timing of local high tides). All work will occur during the daylight hours to avoid disturbance of salt marsh harvest mice and California clapper rails at night. All foods and food-related trash items will be enclosed in sealed trash containers and removed from the site at the end of each workday to prevent attracting predators to the work site.

SFCJPA and SCVWD will minimize the potential for injury and mortality of salt marsh harvest mice and harassment of California clapper rails during annual mowing of the levee slopes by: having a qualified biologist survey the area to be mowed; avoiding mowing suitable wetland, marsh, and transition zone habitat; avoiding mowing during extreme high tide events when salt marsh harvest mice and California clapper rails are most likely to approach the upland areas along the levee slopes; avoiding mowing at night; and stopping mowing if any salt marsh harvest mice or California clapper rails are observed within 50 feet.

SFCJPA and SCVWD will minimize the potential for injury and mortality of salt marsh harvest mice and California clapper rails during rodent control within the action area by prohibiting the use of rodenticides and fumigants within suitable habitat for the salt marsh harvest mouse and California clapper rail. In areas where rodenticides are used, carcass retrieval surveys will be conducted daily for acute toxins and weekly for anticoagulants to minimize secondary poisoning impacts during the use period. Methods of rodent control within salt marsh harvest mouse or California clapper rail habitat will be limited to live trapping. All live traps will have openings measuring no smaller than 2 inches by 1 inch to allow any salt marsh harvest mouse that inadvertently enters the trap to easily escape. All traps will be placed outside of pickleweed areas and above the high tide line.

SFCJPA and SCVWD will minimize the potential for injury and mortality of salt marsh harvest mice and California clapper rails and reduce the level of harassment during installation of the high tide refuge islands in Outer Faber Marsh by avoiding work during the California clapper rail's breeding season; accessing the refuge island sites on foot or boat; a biological monitor will work with the contractor(s) to reduce and minimize the impacts on wetlands from construction access; protective materials such as plywood sheets over geotextile fabric (or equivalent) will be temporarily installed (for a maximum of 2-3 days) to cover all vegetated marsh areas that will be regularly accessed during island construction; using wheelbarrows to transport necessary materials over protective sheets; using skilled personnel and qualified biologists trained in working in sensitive wetland habitats; and utilizing hand tools and manual labor to construct the islands.

Invasive Plant Species

The proposed project has the potential to degrade salt marsh harvest mouse and California clapper rail habitat through the introduction of invasive weeds during proposed project construction. Invasive weeds, such as perennial pepperweed, could spread into marsh habitats when seeds are attached to vehicles, equipment, and clothing. The spread of perennial pepperweed and other invasive plants can displace native marsh vegetation and lower habitat quality for salt marsh harvest mice and California clapper rails by reducing the amount of plants they use for refugia, foraging, and nesting, such as marsh gumplant and pickleweed. Perennial pepperweed provides poor upland refugia cover because the plant is leafless in the winter when the salt marsh harvest mouse and California clapper rail are in most need of suitable upland refugia cover during the more frequent winter extreme high tides and storm events. Without suitable upland refugia cover, the salt marsh harvest mouse and California clapper rail are more vulnerable to predation during extreme high tide events. To minimize the potential for the spread of invasive plants during proposed project implementation, SFCJPA will clean all construction equipment of soil, seed, and plant parts prior to arriving onsite; utilize fill material that is free of vegetation and plant material; utilize certified weed-free erosion control materials; implement a Service-approved revegetation and monitoring plan to ensure all temporarily disturbed areas revegetate with suitable native plant species; and control invasive plant species.

Installation of Rock-Slope Protection

The installation of 3.71 acres of rock-slope protection within the San Francisquito Creek channel could provide denning areas for predators of the salt marsh harvest mouse and the California clapper rail (*e.g.*, foxes, rats, raccoons) if installed in a manner that left voids in between the rocks. This would increase the risk of predation by mammal predators on the salt marsh harvest mouse and the California clapper rail within the action area. SFCJPA will fund the implementation of a five-year mammal predator control program within the action area which will reduce the potential for predation on salt marsh harvest mice and the California clapper rails during the five-year predator control period; however, predation by mammal predators is likely to increase within the action area once the five-year predator management program is terminated.

Altered Hydrology

Main Faber Marsh

Fluvial flood flows above the five-year event (20 percent chance of happening once in any given year) currently spill over from San Francisquito Creek into Main Faber Marsh under average tidal conditions due to an approximately 400-foot-long low spot in the Main Faber Marsh levee downstream of the Friendship Bridge. Once construction of the proposed project is completed, this frequency will decrease to roughly the 25-year event (4 percent chance of happening once in any given year) due to the SFCJPA filling in the low spot in the Main Faber Marsh levee. Hydraulic modeling for the proposed project indicates that there would not be discharge to the Main Faber Marsh from San Francisquito Creek post-project during a two-year, three-year, five-year or 10-year fluvial flood flow event occurring during MHHW. If occurring during a king tide of 10.5 feet, a 10-year flow event would result in a discharge of approximately 100 cfs into Main Faber Marsh, which is a reduction from the volume that would be discharged if these two conditions happened at the same time with the current channel and levee dimensions.

Since salt marsh harvest mice and California clapper rails are most vulnerable to predation during flooding events when cover is limited (Albertson 1995, Service 2013a, Overton *et al.* 2014), any reductions in the frequency of flooding of Main Faber Marsh would likely benefit the mouse and rail by reducing the risk of predation. SFCJPA will further reduce the risk of predation on salt marsh harvest mice and California clapper rails within Main Faber Marsh by contributing funding to a Service- and Refuge-approved five-year predator management program; enhancing transition zone habitat for salt marsh harvest mice and California clapper rails along the southern, eastern, and northern levees of Main Faber Marsh under a Service-approved plan; and installing fencing at the entrance to the southern levee of Main Faber Marsh to deter people and mammal predators from accessing the southern levee. The salt marsh harvest mouse would also benefit from reductions in the frequency of flooding of salt marsh harvest mouse nests within Main Faber Marsh. Salt marsh harvest mice and California clapper rails within the adjacent Laumeister Marsh would also benefit from transition zone habitat enhancement along the northern Main Faber Marsh/southern Laumeister Marsh berm and the implementation of the five-year predator management program.

However, it is not known to what extent reductions in fluvial flooding may alter habitat quality within Main Faber Marsh. Fluvial floods may contribute sediment to Main Faber Marsh which is important for tidal marsh accretion and the ability of the marsh plain to keep up with sea level rise. Thus any decrease in the input of sediment from fluvial flood flows into Main Faber Marsh could decrease the rates of tidal marsh accretion and the ability of the tidal marsh to keep up with sea level rise.

High velocity fluvial flood flows may also scour marsh vegetation and thus reduce the availability of cover for the salt marsh harvest mouse and California clapper rail. Under existing conditions, fluvial flood flows spilling over a low spot in the Main Faber Marsh levee where San Francisquito Creek makes a sharp right turn creates a "fire hose" effect with a zone of concentrated high velocity flows spilling into the tidal marsh of the Main Faber Marsh (A. Riley, SFRWQCB, pers. comm. 2014). The proposed increase in channel capacity within the San Francisquito Creek channel could exacerbate the "fire hose" effect into Main Faber Marsh during flood events (A. Riley, SFRWQCB, pers. comm. 2014). SFCJPA will minimize the "fire hose" effect by filling in the low spot in the Main Faber Marsh levee downstream of the Friendship Bridge.

Fluvial flood flows may also alter vegetation communities within the tidal marsh of the Main Faber Marsh through the introduction of freshwater flows. For example, freshwater discharges from the San Jose/Santa Clara Water Pollution Control Plant since 1970 are thought to have contributed to a net conversion from tidal to brackish marsh and a reduction in habitat quality and population densities of the California clapper rail at the southern end of San Francisco Bay around Coyote Creek (H.T. Harvey and Associates 1989, Service 2013a). However, between 2006 and 2008, a decrease in freshwater outflow from the San Jose/Santa Clara Water Pollution Control Plant has resulted in a shift from brackish marsh to tidal marsh, in turn resulting in a net formation of 77 acres of tidal marsh at the southern end of San Francisco Bay since 1989 (H.T. Harvey Associates 2008, Service 2013a). Thus it is possible that decreases in freshwater flows into Main Faber Marsh could improve habitat quality for the California clapper rail. However, the tidal marsh of the Main Faber Marsh already supports one of the highest densities of California clapper rails range-wide; therefore, it is unlikely that further decreases in freshwater flows would significantly improve habitat quality for California clapper rails except for decreasing the risk of predation as described above.

Freshwater flows increase the biodiversity of the plant community within brackish marsh habitat around San Francisco, San Pablo, and Suisun bays. Thus it is possible that any reductions in freshwater flows may also decrease the biodiversity of plant species within Main Faber Marsh which could alter habitat quality for the salt marsh harvest mouse and California clapper rail. However, since the California clapper rail prefers more saline tidal marshes and the salt marsh harvest mouse occurs in both brackish and saline marsh habitats, it is unlikely that any decreases in freshwater flows into Main Faber Marsh would decrease habitat quality for the salt marsh harvest mouse and California clapper rail.

Outer Faber Marsh

The degrading of the Bay levee will result in an increase in the frequency of fluvial flooding of Outer Faber Marsh thus having the opposite effect described above for Main Faber Marsh. Increases in the frequency of flooding of Outer Faber Marsh may make the marsh less suitable for salt marsh harvest mice and California clapper rails. SFCJPA estimates that degrading the Bay levee will result in three to four additional flood events entering Outer Faber Marsh during large storm events over the 50-year life span of the proposed project.

Additionally, the removal of upland refugia/transition zone habitat along the Bay levee will make salt marsh harvest mice and California clapper rails within Outer Faber Marsh more vulnerable to predation during the more frequent flood events. Recent surveys of Outer Faber Marsh show only two or three California clapper rails occur within Outer Faber Marsh; therefore, the Service anticipates that no more than two or three California clapper rails will be harassed during each of the three to four additional flooding events in Outer Faber Marsh during the 50-year life span of the proposed project. Altered hydrology within Outer Faber Marsh may adversely affect breeding, foraging, and dispersing salt marsh harvest mice or result in the flooding of salt marsh harvest mouse nests; however, the number of breeding salt marsh harvest mice and their nests occurring within Outer Faber Marsh is likely to be low due to the marginal quality of the marsh for breeding salt marsh harvest mice. Degrading the Bay levee could result in an increase in the rate of sedimentation and tidal marsh accretion within Outer Faber Marsh which in the long-term could increase elevations within the marsh making the marsh more suitable for salt marsh harvest mice and California clapper rails.

SFCJPA will minimize the effects of increased flooding and loss of upland refugia/transition zone habitat on salt marsh harvest mice and California clapper rails within Outer Faber Marsh by creating five high-tide refuge islands in Outer Faber Marsh. The high-tide refuge islands will be planted with marsh gumplant and be constructed at high enough elevation to provide cover for salt marsh harvest mice and California clapper rails during most flooding events. The high-tide refuge islands are expected to provide suitable high-tide refuge habitat for the salt marsh harvest mouse and California clapper rail in Outer Faber Marsh within 3-5 years after installation (H.T. Harvey & Associates 2015a). SFCJPA will also minimize the effects of increased flooding and loss of upland refugia/transition zone habitat on salt marsh harvest mice and California clapper rails by enhancing transition zone habitat along the western Outer Faber Marsh levee. SFCJPA will also minimize the risk of predation on salt marsh harvest mice and California clapper rails within Outer Faber Marsh during flooding events by contributing to the Refuge's predator management program within the action area for five years.

Cumulative Effects

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions unrelated to the proposed project are not considered in this section, because they require separate consultation pursuant to section 7 of the Act.

City of Palo Alto Levee O&M Mowing

The City of Palo Alto conducts frequent mowing of the San Francisco Bay Trail levees within the action area along the lower reach of San Francisquito Creek adjacent to the Palo Alto Municipal Golf Course and Palo Alto Airport and along the western side of Main Faber Marsh (K. Murray, SFCJPA, *in litt.* 2015c, 2015d). Levee mowing may result in the harassment of salt marsh harvest mice and California clapper rails and the potential for injury and mortality of salt marsh harvest mice. The level of harassment of salt marsh harvest mice and California clapper rails and potential for injury and mortality of salt marsh harvest mice increases if the mowing is conducted during an extreme high tide or flooding event when the adjacent marsh plain is inundated because this is when the mouse and the rail are most likely to approach the levee to seek cover along the levee that is not submerged. The frequent mowing of the levees also increases the risk of predation on salt marsh harvest mice and California clapper rails within the action area by removing high tide refugia cover the mice and the rails utilize as shelter from predators when the adjacent marsh plain is flooded. Levee mowing during extreme high tide and flooding events may also increase the risk of predation on salt marsh harvest mice and California clapper rails within the action area by flushing the mice and rails from suitable cover or preventing the mice and rails from seeking available unsubmerged cover along the levees. Levee mowing may also introduce and spread invasive plant species which displace higher quality transition zone habitat plant species like marsh gumplant that provide suitable year-round cover for salt marsh harvest mice and California clapper rails during extreme high tide events. The displacement of suitable higher quality transition zone habitat plant species like marsh gumplant that provide year-round suitable cover increases the risk of predation on salt marsh harvest mice and California clapper rails especially during winter extreme high-tide and flooding events when suitable cover is limited.

California clapper rails are sensitive to noise disturbance during the breeding season. For example, Albertson (1995) documented a California clapper rail abandoning its territory in Laumeister Marsh shortly after a repair crew worked on a nearby transmission tower. The California clapper rail did not establish a stable territory within the duration of the breeding season. As a result of this territorial abandonment, the opportunity for successful reproduction during the breeding season was eliminated. Thus noise from levee mowing adjacent to California clapper rail breeding habitat in Main Faber Marsh and along lower San Francisquito Creek during the rail's breeding season may result in the flushing of California clapper rails from their nests and the loss of breeding activity. The flushing of California clapper rails from their nests increases the risk of predation on the adult California clapper rail and its nest. However, it is possible that some California clapper rails may acclimate to noise from frequent levee mowing.

The City of Palo Alto mows about 0.32 acre of salt marsh harvest mouse grassland foraging/ dispersal habitat to control ruderal grasses in an approximately 3-foot wide strip along the top of the levee along the left bank of the lower reach of San Francisquito Creek downstream of Friendship Bridge adjacent to the Palo Alto Municipal Golf Course and the Palo Alto Airport two or three times per year. The City of Palo Alto also mows annually about 0.29 acre of transition zone habitat for the salt marsh harvest mouse and California clapper rail and about 0.32 acre of grassland foraging/dispersal habitat for the salt marsh harvest mouse within an approximately 9-foot-wide by 2,830-foot-long strip along the western Main Faber Marsh levee. The strip of transition zone habitat mowed by the City of Palo Alto along the western Main Faber Marsh levee includes about 50 percent of the City of East Palo Alto's 0.58-acre transition zone habitat enhancement area which is required habitat compensation for the effects of the Runnymede Storm Drainage Improvements Phase II and O'Connor Pump Station Outfall Structure Repair Project on the salt marsh harvest mouse and California clapper rail (Service file number 81420-2011-F-0103-2, Service 2013b). The City of Palo Alto avoids the mowing of the City of East Palo Alto's transition zone shrub mitigation plantings (*e.g.*, marsh gumplant and salt marsh baccharis) during levee mowing within the 0.58-acre habitat compensation area along the western Main Faber Marsh levee; however, the mowing of the grassland vegetation in between the shrubs within the habitat compensation area reduces the ability of the habitat compensation area to provide suitable cover for salt marsh harvest mice during extreme high tide and flooding events and during seasonal foraging and dispersal.

Conclusion

After reviewing the current status of the salt marsh harvest mouse and California clapper rail, the environmental baseline for the action area, the effects of the proposed San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, and the cumulative effects, it is the Service's biological opinion that the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, as proposed, is not likely to jeopardize the continued existence of the salt marsh harvest mouse and California clapper rail. The Service reached this conclusion because the project-related effects to these species, when added to the environmental baseline and analyzed in consideration of all potential cumulative effects, will not rise to the level of precluding recovery or reducing the likelihood of survival of these species based on the following: (1) successful implementation of the conservation measures described in this biological opinion will minimize the adverse effects on individual salt marsh harvest mice and California clapper rails; (2) the avoidance of construction activities within 700 feet of California clapper rail activity centers during the rail's breeding season; (3) the small amount of habitat within Main Faber Marsh that will be directly disturbed; (4) the reduction in the frequency of flood flows entering Main Faber Marsh due to filling in low spots in the levee along San Francisquito Creek will reduce the risk of predation on salt marsh harvest mice and California clapper rails and the potential for flooding of salt marsh harvest mouse nests in Main Faber Marsh; (5) the creation of an additional approximately 6.90 acres of suitable tidal marsh habitat for the salt marsh harvest mouse and an additional approximately 1.09 acres of suitable tidal marsh habitat for the California clapper rail within the widened San Francisquito Creek channel; (6) the creation of an additional approximately 1.64 acres of suitable upland refugia/ transition zone habitat for the salt marsh harvest mouse and California clapper rail along the widened San Francisquito Creek channel; and (7) the reduction in predation levels on the salt marsh harvest mouse and California clapper rail within Main Faber Marsh and Outer Faber Marsh due to SFCJPA's contribution to the Refuge's predator management program for at least five years, the enhancement of 5.66 acres of transition zone habitat along the Main Faber Marsh and Outer Faber Marsh perimeter levees, and the installation of fencing to deter people and mammal predators from accessing the southern Main Faber Marsh levee.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is defined by Service regulations at 50 CFR 17.3 as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Harm is defined by the same regulations as an act which actually kills or injures wildlife. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

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

Amount or Extent of Take

Salt Marsh Harvest Mouse

The Service anticipates incidental take of individual salt marsh harvest mice will be difficult to detect or quantify because of the variable, unknown size of any resident population over time, their elusive and cryptic behavior, and the difficulty of finding killed or injured animals. Due to the difficulty in quantifying the number of salt marsh harvest mice that will be taken as a result of the proposed project, the Service is quantifying take incidental to the proposed project as the following:

1. The harassment and non-lethal harm of all salt marsh harvest mice within the 3.64 acres of suitable tidal marsh habitat, 1.89 acres of suitable diked marsh habitat, 13.05 acres of suitable ruderal grassland foraging/dispersal habitat, and 2.46 acres of suitable upland refugia/ transition zone habitat temporarily disturbed during construction of the proposed project (*i.e.*, construction of the San Francisquito Creek levees and widened channel, filling in low spots in the Main Faber Marsh levee, and accessing and degrading the Bay levee).

2. The harassment and harm of all salt marsh harvest mice within the 0.82 acre of suitable tidal marsh habitat, 0.79 acre of suitable diked marsh habitat, 1.28 acres of suitable ruderal grassland habitat, and 0.27 acre of suitable upland refugia/transition zone habitat permanently lost during construction of the proposed project (*i.e.*, construction of the San Francisquito Creek levees and widened channel, filling in low spots in the Main Faber Marsh levee, and accessing and degrading the Bay levee).

3. The harassment of all salt marsh harvest mice within the 5.66 acres of low quality transition zone habitat temporarily disturbed along a total of 5,120 linear feet of the southern, eastern, and northern Main Faber Marsh perimeter levees and the western Outer Faber Marsh perimeter levee during transition zone habitat enhancement.

4. The harassment of all salt marsh harvest mice within the 0.19 acre of suitable tidal marsh habitat temporarily disturbed during installation of five high tide refuge islands in Outer Faber Marsh.

5. The ongoing harassment and non-lethal harm of all salt marsh harvest mice within 6.49 acres of ruderal grassland foraging/dispersal habitat disturbed up to three times per year during annual levee mowing along the San Francisquito Creek levee slopes.

6. The harassment of all salt marsh harvest mice within the 13.8 acres of suitable tidal marsh and transition zone habitat in Outer Faber Marsh during four additional flooding events during the 50-year life span of the proposed project.

7. The injury or mortality of two adult salt marsh harvest mice and four juvenile salt marsh harvest mice.

California Clapper Rail

The Service anticipates incidental take of individual California clapper rails will be difficult to detect or quantify because of the variable, unknown size of any resident population over time, their elusive and cryptic behavior, and the difficulty of finding killed or injured animals. Due to the difficulty in quantifying the number of California clapper rails that will be taken as a result of the proposed project, the Service is quantifying take incidental to the proposed project as the following:

1. The harassment and non-lethal harm of all California clapper rails within the 1.57 acres of suitable tidal marsh habitat and 2.46 acres of suitable upland refugia/transition zone habitat temporarily disturbed during the construction of the proposed project (*i.e.*, construction of the San Francisquito Creek levees and widened channel, filling in low spots in the Main Faber Marsh levee, and accessing and degrading the Bay levee).

2. The harassment and non-lethal harm of all California clapper rails within the 0.36 acre of suitable tidal marsh habitat and 0.27 acre of suitable upland refugia/transition zone habitat permanently lost during the construction of the proposed project (*i.e.*, construction of the San Francisquito Creek levees and widened channel, filling in low spots in the Main Faber Marsh levee, and accessing and degrading the Bay levee).

3. The harassment of all California clapper rails within the 0.19 acre of tidal marsh disturbed during installation of up to five high-tide refuge islands within Outer Faber Marsh.

4. The harassment of all California clapper rails within the 5.66 acres of low quality transition zone habitat temporarily disturbed along 5,120 linear feet of the southern, eastern, and northern Main Faber Marsh levees and western Outer Faber Marsh levee during transition zone habitat enhancement.

5. The harassment of all California clapper rails within the 13.8 acres of suitable tidal marsh and transition zone habitat in Outer Faber Marsh during four additional flooding events during the 50-year life span of the proposed project.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the salt marsh harvest mouse and California clapper rail.

Reasonable and Prudent Measures

All necessary and appropriate measures to avoid or minimize effects on the salt marsh harvest mouse and California clapper rail resulting from implementation of the proposed project have been incorporated into the project's proposed conservation measures. Therefore, the Service believes the following reasonable and prudent measure is necessary and appropriate to minimize incidental take of the salt marsh harvest mouse and California clapper rail:

1. All conservation measures, as described in the biological assessment and restated here in the Description of the Proposed Project section of this biological opinion, shall be fully implemented and adhered to. Further, this reasonable and prudent measure shall be supplemented by the terms and conditions below.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measure described above. These terms and conditions are nondiscretionary.

1. The Corps shall include full implementation and adherence to the conservation measures as a condition of any permit or contract issued for the proposed project.

2. The Corps shall ensure that no rodenticides are used within 328 feet of suitable habitat for the salt marsh harvest mouse and California clapper rail.

3. The Corps shall ensure that any mammals trapped during rodent control that are potential predators of the California clapper rail or salt marsh harvest mouse (*e.g.*, Norway rats, feral cats, skunks, red foxes, raccoons, opossums) are dispatched and removed from the site.

4. The Corps shall ensure that SFCJPA has a plan for marsh ecotone/transition zone habitat enhancement along the Main Faber Marsh and Outer Faber Marsh levees and avian and mammal predator monitoring and management within the action area reviewed and approved by the Service prior to the initiation of construction of the proposed project. The marsh ecotone/transition zone habitat enhancement and the funding for predator management shall be initiated within one year of the initiation of construction of the proposed project.

5. The Corps shall ensure that SFCJPA has a plan for the installation of the permanent high-tide refuge islands in Outer Faber Marsh reviewed and approved by the Service within six months of the initiation of construction of the proposed project. The permanent high-tide refuge islands shall be installed within two years of the initiation of construction of the proposed project.

6. The Corps shall ensure that SFCJPA installs the rock-slope protection in a manner that minimizes voids in between the rocks that could provide denning areas for predators of the salt marsh harvest mouse and California clapper rail.

Monitoring

In order to monitor whether the amount or extent of incidental take anticipated from implementation of the project is approached or exceeded, the Corps shall adhere to the following reporting requirements. Should this anticipated amount or extent of incidental take be exceeded, the Corps must immediately reinitiate formal consultation as per 50 CFR 402.16.

a. For those components of the action that will result in habitat degradation or modification whereby incidental take in the form of harm is anticipated, the Corps shall provide bimonthly updates to the Service with a precise accounting of the total acreage of habitat impacted. Updates shall also include any information about changes in project implementation that result in habitat disturbance not described in the Description of the Proposed Project and not analyzed in this Biological Opinion.

b. For those components of the action that may result in direct encounters between listed species and project workers and their equipment whereby incidental take in the form of harassment, harm, injury, or death is anticipated, the Corps shall immediately contact the Service's Sacramento Fish and Wildlife Office (SFWO) at (916) 414-6623 to report the encounter. If encounter occurs after normal working hours, the Corps shall contact the SFWO at the earliest possible opportunity the next working day. When injured or killed individuals of the listed species are found, the Corps shall follow the steps outlined in the Salvage and Disposition of Individuals section below.

c. The Corps shall ensure that SFCJPA or SCVWD provide annual reports to the Service during the five-year post-construction monitoring period on the status of revegetation and invasive plant species control of the temporarily disturbed areas, tidal marsh creation/

restoration within the widened San Francisquito Creek floodplain, transition zone habitat enhancement along the Main Faber Marsh and Outer Faber Marsh perimeter levees, and revegetation of the permanent high-tide refuge islands in Outer Faber Marsh.

d. The Corps shall ensure that SFCJPA or the U.S. Department of Agriculture Wildlife Services provides annual reports to the Service on the implementation of the avian and mammalian predator monitoring and management program within the action area. The annual reports should include the number of each species of avian and mammal predator observed, the number of each species of predator removed, and the frequency of monitoring for predators.

Disposition of Individuals Taken

Injured listed species must be cared for by a licensed veterinarian or other qualified person(s), such as the Service-approved biologist. Dead individuals must be sealed in a resealable plastic bag containing a paper with the date and time when the animal was found, the location where it was found, and the name of the person who found it, and the bag containing the specimen frozen in a freezer located in a secure site, until instructions are received from the Service regarding the disposition of the dead specimen. The Service contact person is the Coast/Bay Division Chief of the Endangered Species Program at the SFWO at (916) 414-6623.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following actions:

1. Develop, fund, and annually implement a predator management program for controlling avian and mammal predators that threaten the salt marsh harvest mouse and California clapper rail, western snowy plover, and California least tern. Fund the monitoring of PG&E transmission towers for avian predators within suitable habitat for the salt marsh harvest mouse and California clapper rail and report any raptor nests to PG&E and the Refuge for removal. Work with PG&E to install raptor perch deterrents on their transmission towers within suitable habitat for the salt marsh harvest mouse and California clapper rail.

2. Control rat populations within the City of East Palo Alto near the Faber and Laumeister marshes.

3. Decommission trails or require that dogs be kept on a leash near breeding habitat for the California clapper rail. Avoid constructing trails near suitable habitat for the California clapper rail and salt marsh harvest mouse. Enforce dog leash laws along the San Francisco Bay Trail.

4. Remove raptor perches near suitable habitat for the salt marsh harvest mouse and California clapper rail.

5. Prohibit the feeding of wildlife near suitable habitat for the salt marsh harvest mouse and California clapper rail.

6. Control invasive perennial pepperweed within suitable upland transition zone and tidal marsh habitat for the salt marsh harvest mouse and California clapper rail and implement measures to minimize the introduction and spread of perennial pepperweed and other invasive plant species.

7. Restore tidal marsh habitat and marsh ecotone/transition zone habitat for the California clapper rail and salt marsh harvest mouse in priority areas identified in the Recovery Plan.

8. Report sightings of any listed or sensitive animal species to the CNDDB of the CDFW. A copy of the reporting form and a topographic map clearly marked with the location the animals were observed also should be provided to the Service.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the proposed San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, from San Francisco Bay to Highway 101, in the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any additional take will not be exempt from the prohibitions of section 9 of the Act, pending reinitiation.

If you have any questions regarding this biological opinion on the proposed San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project please contact Joseph Terry, Senior Biologist, or Ryan Olah, Coast/Bay Division Chief, at the letterhead address, electronic mail (Joseph_Terry@fws.gov; Ryan_Olah@fws.gov), or at telephone (916) 943-6721.

Sincerely,

Jennifer M. Norris (FOR)
Field Supervisor

cc:
Anne Morkill, San Francisco Bay National Wildlife Refuge Complex, Fremont, California
Kim Squires, Bay/Delta Fish and Wildlife Office, Sacramento, California
Tami Schane, California Department of Fish and Wildlife, Napa, California
Susan Glendening, San Francisco Bay Regional Water Quality Control Board, Oakland, California
Len Materman, San Francisquito Creek Joint Powers Authority, Menlo Park, California
Amanda Morrison, National Oceanic and Atmospheric Administration/National Marine Fisheries Service, Santa Rosa, California
Brenda Goeden, San Francisco Bay Conservation and Development Commission, San Francisco, California

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Murray, Kevin. 2015a. Project Manager, San Francisquito Creek Joint Powers Authority, Menlo Park, California. Memo sent to Joseph Terry, Senior Biologist, U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California, dated July 24, 2015. Subject: Response to U.S. Fish and Wildlife Service's December 2, 2014 Information Request on the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project, from San Francisco Bay to Highway 101 in the City of East Palo Alto, San Mateo County, and the City of Palo Alto, Santa Clara County, California.

Murray, Kevin. 2015b. Project Manager, San Francisquito Creek Joint Powers Authority, Menlo Park, California. Memo sent to Joseph Terry, Senior Biologist, U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California, dated July 24, 2015. Subject: San Francisquito Creek Flood Protection and Ecosystem Restoration Project, East Bayshore Road To San Francisco Bay: Proposed Mitigation Activities.

Murray, Kevin. 2015c. Project Manager, San Francisquito Creek Joint Powers Authority, Menlo Park, California. Electronic mail messages sent to Joseph Terry, Senior Biologist, U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California, dated September 9, 2015. Subject: Information need for the San Francisquito Creek Flood Control biological opinion.

Murray, Kevin. 2015d. Project Manager, San Francisquito Creek Joint Powers Authority, Menlo Park, California. Electronic mail message sent to Joseph Terry, Senior Biologist, U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California, dated October 5, 2015. Subject: Responses to clarification requests from the Service.

Murray, Kevin. 2015e. Project Manager, San Francisquito Creek Joint Powers Authority, Menlo Park, California. Electronic mail message sent to Joseph Terry, Senior Biologist, U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, Sacramento, California, dated October 26, 2015. Subject: SFCJPA responses to the Service's October 19, 2015 follow up questions to SFCJPA.

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Personal Communications

Albertson, Joy. Supervisory Wildlife Biologist, San Francisco Bay National Wildlife Refuge Complex, Fremont, California.

Allan, Kate. Wildlife Biologist, WRA Environmental Consulting, San Rafael, California.

McBroom, Jen. Clapper Rail Monitoring Manager, Olofson Environmental, Inc., Oakland, California.

Mruz, Eric. Refuge Manager, Don Edwards San Francisco Bay National Wildlife Refuge, Fremont, California.

Overton, Cory. Wildlife Biologist, U.S. Geological Survey, Dixon, California.

Perrera, Robert. Biological Monitor, Huffman-Broadway Group, Inc., San Rafael, California.

Popper, Brian J. Wildlife Biologist, U.S. Department of Agriculture Wildlife Services, San Luis District, Fremont, California.

Riley, Ann L. Watershed and Stream Protection Advisor, San Francisco Bay Regional Water Quality Control Board, Oakland, California.

Strong, Cheryl. Wildlife Biologist, Don Edwards San Francisco Bay National Wildlife Refuge, Fremont, California.

Tertes, Rachel. Wildlife Biologist, Don Edwards San Francisco Bay National Wildlife Refuge, Fremont, California.

Don Edwards San Francisco Bay National Wildlife Refuge
General Activities Special Use Permit

Permit #: 2016-07

(For Official Use Only)

Permit Term: From: 9/1/2016 To: 1/31/2017

1) Permittee Name/Business: Kevin Murray, San Francisquito Creek Joint Powers Authority

2) Permit Activity Type: restoration in Faber Tract marsh as part of the San Francisquito Creek project

2) Permit Status:

- [x] Approved — If approved, provide special conditions (if any) in the text box below.
- [ ] Denied — If denied, provide justification in the text box below.

Restoration activities within and around Faber Tract marsh related to the San Francisquito Creek project and agreed to by the USFWS, COE and the JPA including: degrading of a portion of the levee between the Creek and Outer Faber Tract, and the raising and grading of a portion of the levee between the Creek and Faber Tract adjacent to the mosquito ponds (see design sheets, on file). Project subject to conditions in the Biological Opinion (on file) and attached to this SUP. Permittee is responsible for all conditions and enforcement of conditions with contractors.

3) Are there additional special conditions attached to the permit? (•) Yes ( ) No ( ) N/A

4) Are other licenses/permits required, and have they been verified? (•) Yes ( ) No ( ) N/A

5) Are Insurance and/or Certification(s) required, and have they been verified? ( ) Yes ( ) No (•) N/A

6) Record of Payments: ( ) Full ( ) Partial (•) Exempt

7) Is a surety bond or security deposit required? ( ) Yes ( ) No (•) N/A

This permit is issued by the U.S. Fish and Wildlife Service and accepted by the applicant signed below, subject to the terms, covenants, obligations, and reservations, expressed or implied therein, and to the notice, conditions, and requirements included or attached. A copy of this permit should be kept on-hand so that it may be shown at any time to any refuge staff

8) Permit approved/issued by: (Signature and title)

Cheryl Strong

Date: 18 February 2016

9) Permit accepted by: (Signature of permittee)

Kevin Murray

Date: February 19, 2016

General Conditions and Requirements

1) Responsibility of Permittee: The permittee, by operating on the premises, shall be considered to have accepted these premises with all facilities, fixtures, or improvements in their existing condition as of the date of this permit. At the end of the period specified or upon earlier termination, the permittee shall give up the premises in as good order and condition as when received except for reasonable wear, tear, or damage occurring without fault or negligence. The permittee will fully repay the Service for any and all damage directly or indirectly resulting from negligence or failure on his/her part, and/or the part of anyone of his/her associates, to use reasonable care.

2) Operating Rules and Laws: The permittee shall keep the premises in a neat and orderly condition at all times, and shall comply with all municipal county, and State laws applicable to the operations under the permit as well as all Federal laws, rules, and regulations governing national wildlife refuges and the area described in this permit. The permittee shall comply with all instructions applicable to this permit issued by the refuge official in charge. The permittee shall take all reasonable precautions to prevent the escape of fires and to suppress fires and shall render all reasonable assistance in the suppression of refuge fires.

3) Use Limitations: The permittee's use of the described premises is limited to the purposes herein specified and does not, unless provided for in this permit, allow him/her to restrict other authorized entry onto his/her area; and allows the U.S. Fish and Wildlife Service to carry on whatever activities are necessary for: (1) protection and maintenance of the premises and adjacent lands administered by the U.S. Fish and Wildlife Service; and (2) the management of wildlife and fish using the premises and other U.S. Fish and Wildlife Service lands.

4) Transfer of Privileges: This permit is not transferable, and no privileges herein mentioned may be sublet or made available to any person or interest not mentioned in this permit. No interest hereunder may accrue through lien or be transferred to a third party without the approval of the Regional Director of the U.S. Fish and Wildlife Service and the permit shall not be used for speculative purposes.

5) Compliance: The U.S. Fish and Wildlife Service's failure to require strict compliance with any of this permit's terms, conditions, and requirements shall not constitute a waiver or be considered as a giving up of the U.S. Fish and Wildlife Service's right to thereafter enforce any of the permit's terms or conditions.

6) Conditions of Permit not Fulfilled: If the permittee fails to fulfill any of the conditions and requirements set forth herein, the U.S. Fish and Wildlife Service shall retain all money paid under this permit to be used to satisfy as much of the permittee's obligation as possible.

7) Payments: All payment shall be made on or before the due date to the local representative of the U.S. Fish and Wildlife Service by a postal money order or check made payable to the U.S. Fish and Wildlife Service.

8) Termination Policy: At the termination of this permit the permittee shall immediately give up possession to the U.S. Fish and Wildlife Service representative, reserving, however, the rights specified in paragraph 11 below. If he/she fails to do so, he/she will pay the U.S. Fish and Wildlife Service, as liquidated damages, an amount double the rate specified in this permit for the entire time possession is withheld. Upon yielding possession, the permittee will still be allowed to reenter as needed to remove his/her property as stated in paragraph 11 below. The acceptance of any fee for the liquidated damages or any other act of administration relating to the continued tenancy is not to be considered as an affirmation of the permittee's action nor shall it operate as a waiver of the U.S. Fish and Wildlife Service's right to terminate or cancel the permit for the breach of any specified condition or requirement.

9) Revocation Policy: The Regional Director of the U.S. Fish and Wildlife Service may revoke this permit without notice for noncompliance with the terms hereof, or for violation of general and/or specific laws or regulations governing national wildlife refuges, or for nonuse. It is at all times subject to discretionary revocation by the Director of the Service. Upon such revocation the U.S. Fish and Wildlife Service, by and through any authorized representative, may take possession of said premises for its own and sole use, and/or may enter and possess the premises as the agent of the permittee and for his/her account.

10) Damages: The U.S. Fish and Wildlife Service shall not be responsible for: any loss or damage to property including but not limited to crops, animals, and machinery; injury to the permittee or his/her relatives or to the officers, agents, employees, or any other(s) who are on the premises from instructions; the sufferance from wildlife or employees or representatives of the U.S. Fish and Wildlife Service carrying out their official responsibilities. The permittee agrees to hold the U.S. Fish and Wildlife Service harmless from any and all claims for damages or losses that may arise to be incident to the flooding of the premises resulting from any associated government river and harbor, flood control, reclamation, or Tennessee Valley Authority activity.

11) Removal of Permittee's Property: Upon the expiration or termination of this permit, if all rental charges and/or damage claims due to the U.S. Fish and Wildlife Service have been paid, the permittee may, within a reasonable period as stated in the permit or as determined by the U.S. Fish and Wildlife Service official in charge, but not to exceed 60 days, remove all structures, machinery, and/or equipment, etc., from the premises for which he/she is responsible. Within this period the permittee also must remove any other of his/her property including his/her acknowledged share of products or crops grown, cut, harvested, stored, or stacked on the premises. Upon failure to remove any of the above items within the aforesaid period, they shall become the property of the U.S. Fish and Wildlife Service.

FOR ANY LAW ENFORCEMENT ISSUES PLEASE CALL DISPATCH AT 415-561-5510. BE PREPARED TO EXPLAIN WHO AND WHERE YOU ARE.

1. Permittee or designee must carry a copy of permit and the research / study proposal when on Refuge lands. Permittees and designees will place the appropriate placard on the dashboard of all vehicles while on the Refuge and behind locked gates.

2. Permittee is responsible for meeting all conservation measures (pages 15-27) of the biological opinion, dated 15 January 2015, and for enforcing said conditions with any contractor(s). A biological monitor will be on site during all activiites.

3. Work includes the degrading of a portion of the levee between the Creek and Outer Faber Tract, and the raising and grading of a portion of the levee between the Creek and Faber Tract adjacent to the mosquito ponds as specified in the design plans dated Feb 2016.

4. Permittee will not interfere with ongoing Dept. of Agriculture-Wildlife Service's predator management activities. Permittee will not interfere with work by Cargill Salt Division or Refuge visitors using public trails.

5. All work will be conducted in a manner which minimizes disturbance to wildlife and damage to wetland habitat. Noise must be minimized to prevent wildlife disturbance.

6. **Permittee may not drive on levees for 3-5 days after a moderate rain or under conditions that may damage the levee. Any damage caused by construction and access will be repaired by pemirttee.** When permittee encounters visitors on Refuge trails, speed will be reduced to prevent dust and unnecessary disturbance of visitors.

7. Permittee will immediately report any active burrowing owl burrows to Refuge Biologists.

8. Permittee will immediately report all sightings or feral cats, dogs, red fox, or active raven and hawk nests (on PG&E towers) observed on the Refuge. Fox dens will not be approached or searched.

9. **Access into salt marsh habitat is prohibited** except on boardwalks, railroad grades, and similar structures. No access to the marsh will be allowed during the California clapper rail breeding season, 1 February to August 31. Marsh access is not permitted during extreme high tide events (>6.5 at GG) to reduce impacts to tidal marsh species looking for refugia. Exceptions to this must be cleared by Refuge biologists prior to access.

10. All locked gates opened must immediately be shut and locked behind you. TAKE CARE NOT TO LOOK OUT ANY OTHER LOCKS IN THE CHAIN LOOP.

11. Refuge contacts: Cheryl Strong, biologist, 510-557-1271, Cheryl_strong@fws.gov; and Chris Barr, acting Refuge manager, 510-792-0222 ext. 127.

San Francisco Bay Conservation and Development Commission
455 Golden Gate Avenue, Suite 10600, San Francisco, California 94102 tel 415 352 3600 fax 415 352 3606

Permittee's Copy

PERMIT NO. 2013.007.00

February 22, 2016

San Francisquito Creek Joint Powers Authority
615 B Menlo Avenue
Menlo Park, CA 94025

ATTENTION: Mr. Len Materman

Ladies and Gentlemen:

On February 18, 2016 the San Francisco Bay Conservation and Development Commission, by a vote of 17 affirmative, 0 negative, and 0 abstentions, approved the resolution pursuant to which this permit is hereby issued:

I. Authorization

A. Subject to the conditions stated below, the permittee, the San Francisquito Creek Joint Powers Authority, is granted permission to do the following:

Location: In the Bay and within the 100-foot shoreline band, within the lower reach of the San Francisquito Creek (SFC) and adjacent Faber Tract Marsh, between the Counties of San Mateo and Santa Clara.

In the Bay:

1. Construct up to five, high tide refugia islands in Outer Faber Marsh by placing approximately 1,250 square feet (250 square feet per island; 0.006 acres) of imported solid fill in the Marsh. Each island would be approximately 10 feet by 30 feet in size and constructed to an initial elevation of approximately 8.8 feet (NAVD88), planted with native marsh gumplant and other tall stature wetland vegetation (Exhibit F);
2. Excavate approximately 1,470 cubic yards (cy) of sediment from an approximately 23,600-square-foot area of the creek channel and dispose of the material at an upland disposal location;
3. Remove 390 feet of abandoned sanitary sewer line within BCDC's Bay jurisdiction located near Friendship Bridge and install 810 feet of new sewer line embedded at least 6.0 feet or deeper below the channel mudline;
4. Construct an approximately 2,062-square-foot, wooden, pile-supported boardwalk (approximately 202 feet long and 10 feet wide) over the newly created marsh plain terrace to connect the abutment of the left side of Friendship Island to the newly realigned SFC south levee (L-line levee in the *San*

Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project Draft Plans dated July 2015) within the Commission's future Bay jurisdiction;

5. Construct one "steelhead passage feature" in the creek, including a permanent rock spur (partial weir), consisting of approximately 1,710 square feet of large rock and other solid fill in the channel; and
6. Place approximately 12,810 square feet of temporary solid fill during in-channel construction occurring over a two-year period, which includes:
   a. Installing an approximately 1,850-foot-long, 36-inch diameter HDPE diversion pipe along the outboard side of the SFC north levee (R-line levee in the *San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project* Draft Plans dated July 2015);
   b. Constructing a temporary, steel sheet pile cofferdam, approximately 12 feet tall and 160 feet long, spanning the width of the channel;
   c. Placing gravel-filled bags around the connection between the pipe and the cofferdam walls;
   d. Placing approximately 7,256 square feet of rock within the channel as an energy dissipater for the diversion pipe water outflow;
   e. Dewatering the channel and creek for in-channel construction activities from June through October during each year of the two-year construction (2016-2018); and
   f. Removing all temporary fill (water diversion pipes, rock and cofferdam, etc.) following the closure of the in-channel work window.

Partially Within the Bay and 100-foot Shoreline Band:

1. Place approximately 26,340 square feet of riprap around the eastern footings of Friendship Bridge (future Friendship Island);
2. Place approximately 28,480 square feet of riprap along the inboard side of the SFC north levee, along Faber Tract Marsh near Friendship Bridge, and along the inboard side of the SFC southern levee to stabilize shoreline features during increased flood flows within the creek;
3. Place approximately 11,140 square feet of clean fill along the outboard side of the SFC north levee, in the Faber Tract Marsh to stabilize and restore low portions of the levee from 11 feet (NAVD88) to approximately 13 feet (NAVD88). Extend the outboard side of a portion of the SFC north levee at a 6:1 slope into Faber Tract Marsh to protect the toe of the existing levee from failure during high flow events;

4. Restore 1.74 acres of high marsh and transitional habitat along and within San Francisquito Creek, and the north and south levees as part of the total 15.14-acre high marsh/transition zone restoration effort. This would include 0.88 acres of newly created high marsh plain terrace in the Commission's future Bay and shoreline band jurisdictions and restoration of 0.86 acres of high marsh/transition zone along the edges of the creek; and
5. Restore 1.7 acres of high marsh and transition zone habitats in the Faber Tract Marsh within the Commission's Bay and shoreline band jurisdictions.

Within the 100-foot Shoreline Band:

1. Degrade approximately 600 linear feet (37,680 square feet) of an unmaintained section of the existing SFC north levee that runs between the Outer Faber Marsh and the terminus of San Francisquito Creek from 10-12 foot elevation (NAVD88) to approximately 8 feet (NAVD 88) to create a connection between the creek and the Outer Faber Marsh during high flow periods. Use approximately 4,000 cy of excavated soils for levee fill if it is suitable for this use;
2. Degrade portions of the existing paved SFC south levee (approximately 700 linear feet; 60,380 square feet) to an elevation of 7 feet (NAVD 88) and widen the existing channel, and setback portions of the existing SFC south levee into the golf course, outside the Commission's current jurisdiction. Setting the levee back would expand the Commission's Bay and shoreline band jurisdictions beyond their current boundary (Exhibit C);
3. Place approximately 56,480 square feet of new fill for a portion of the newly aligned SFC south levee, within the Commission's existing and future shoreline band jurisdiction and realign 600 linear feet of the public access along the new SFC south levee top. The new SFC south levee along the golf course would be approximately 80 feet wide at the base and 14 feet tall;
4. Pave and maintain 600 linear feet of the newly realigned public access trail running along the crown of the realigned SFC south levee and therefore restoring the Bay Trail;
5. Temporarily close existing public access trails on the south side of the San Francisquito Creek near Friendship Bridge during construction operations;
6. Leave portions of the existing SFC south levee connection with Friendship Bridge to create an island (Friendship Island) in the center of the newly widened channel;
7. Stockpile topsoil removed during excavation and reuse stockpiled soil to repair areas disturbed during construction;

8. Install and maintain at least one interpretive sign related to Faber Tract Marsh at an approved location near Friendship Bridge or the newly constructed boardwalk;
9. Install and maintain at least seven BCDC public shoreline signs at approved locations to notify the public of where to access the shoreline;
10. Remove old PG&E gas utility lines and install a new 24-inch gas line upstream of Friendship Bridge via micro-tunneling;
11. Construct a steel sheet pile floodwall up to four feet above (18.40 NAVD 88) the existing SFC north levee top of bank and along approximately 500 feet of shoreline near the O'Connor Way Pump Station and Friendship Bridge (between about STA 28+00 to STA 33+00) to connect the outfall structure to the adjacent levees, a portion of which is within the Commission's jurisdiction;
12. Plant native high marsh vegetation on approximately 5,120 feet (approximately 6 acres) along the levees on the north, east, and south sides of Faber Tract Marsh to improve high tide refuge areas;
13. Utilize certain areas for the staging of construction equipment or materials (Exhibit D); and
14. Install, use and maintain a fence to exclude predators from entering the Faber Tract Marsh on the northern side of the San Francisquito Creek via the SFC north levee. The length, height and materials of the fence shall be reviewed and approved pursuant to Special Condition II-G-3, herein.

B. This authority is generally pursuant to and limited by your application dated August 26, 2013, including all accompanying and subsequently submitted correspondence and exhibits, subject to the modifications required by conditions herein.

C. Work authorized herein must commence prior to September 1, 2016, or this permit will lapse and become null and void. All work authorized herein must be diligently pursued to completion and must be completed within two years of commencement or by October 15, 2018 whichever is earlier, unless an extension of time is granted by amendment of the permit. Changes in the work authorized will likely require amendments to the authorization.

D. After completion of construction, the project will result in the placement of approximately 2,060 square feet (0.05 acres) of pile-supported fill for new public access over the Bay and approximately 22,000 square feet (9,990 cy) of solid fill. The project will open up a constriction point near the mouth of San Francisquito Creek, by removing approximately 37,680 square feet (3,380 cy) of existing fill. In the Commission's Bay and shoreline band jurisdictions, the project will place approximately 54,820 square feet (10,150 cubic yards) of solid fill (rock riprap) to reinforce parts of the inboard sides of SFC north and SFC south levees and protect footings on Friendship Bridge, and will place approximately 11,140 square feet (12,000 cy) of solid fill (soil) to reinforce a portion of the SFC north levee. The project will place small amounts of fill for habitat improvements, including 1,250 square feet for high tide refugia islands and approximately 1,710 square feet of rock for steelhead habitat features. In total, the project will result in a net increase of Bay fill of approximately 24,000 square feet (0.55 acres).

Table 1. Fill Areas for the project (in square feet)

		Bay Jurisdiction (sf)		Shoreline Band Jurisdiction (sf)		
Description	**Type of Fill**	**To Be Removed**	**To Be Placed**	**To Be Removed**	**To Be Placed**	**Total Net Fill Area (sf)**
SFC north and south levee riprap	Solid	0	7,130	0	21,350	28,480
Friendship Island Riprap	Solid	0	2,650	0	23,690	26,340
SFC north levee outboard side	Solid	0	8,460	0	2,680	11,140
Fish passage structures (rock)	Solid	0	1,710	0	0	1,710
SFC south levee fill	Solid	0	3,530	-60,380	52,950	-3,900
Outer Faber Marsh levee degrade	Solid	-2,810	0	-34,870	0	-37,680
Earth fill for Faber Marsh levees and high tide refugia	Solid	0	1,250	0	540	1,790
Temporary Cofferdam and other construction structures	Temporary	-12,810	12,810	0	0	0
Total Solid Fill		**21,920 (9,990 cy)**		**5,960**		**27,880**
Boardwalk	Pile-Supported	0	2,060	0	0	2,060
Total Pile-Supported Fill		**2,060**				**2,060**
TOTAL BAY FILL (sf)		**23,980**				**29,940**

Table 2. Habitat Restoration in BCDC's jurisdiction (in acres)

Restoration Technique	Habitat Restoration Surface Area (acres)		
	Bay Jurisdiction	Shoreline Band Jurisdiction	Total
Faber Marsh			
Active Revegetation Creation			
High Marsh Habitat	0.00	0.00	
High Marsh Transition Habitat	0.00	0.80	
Active Revegetation Enhancement			
High Marsh Habitat	0.00	0.00	
*High Marsh Transition Habitat**	0.09	0.00	
Passive Re-establishment**	0.81	0.00	
Faber Marsh Tidal Habitat	0.90	0.80	1.7
Active Revegetation Enhancement			
Upland Berm Refugia Habitat	0.00	6.00	
Faber Marsh Total ***	**0.90**	**6.80**	7.7
San Francisquito Creek			
Active Revegetation Creation			
High Marsh Habitat	0.31	0.03	
High Marsh Transition Habitat	0.36	0.18	
Active Revegetation Enhancement			
High Marsh Habitat	0.54	0.00	
High Marsh Transition Habitat	0.00	0.00	
Passive Re-establishment	0.29	0.03	
San Francisquito Creek Subtotal	**1.50**	**0.24**	**1.74**
Total	**2.40**	**7.04**	**9.44**

* Includes 0.03 ac of tidal marsh within Bay Jurisdiction that will be temporarily impacted by refuge island construction and actively revegetated with native marsh vegetation.
** Includes 0.16 ac of tidal marsh within Bay Jurisdiction that will be temporarily impacted by refuge island construction access and will re-establish naturally post-construction.
*** Tidal marsh habitat and berm refugia habitat combined

II. Special Conditions

The authorization made herein shall be subject to the following special conditions, in addition to the standard conditions in Part IV:

A. **Specific Plans and Plan Review.**

1. **Construction.** The final construction plans submitted pursuant to this condition shall generally conform to HDR's *San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project* (Draft 100% Design dated July 2015). Additionally, the permittee shall submit construction plans for the pile-supported boardwalk, bollards, public access signs, steelhead passage features or any other project elements not included in the *San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project* (Draft 100% Design dated July 2015) construction plans prior to conducting any work on these project elements. Final plans for the construction of the structures authorized herein shall be prepared and submitted for Commission review as described below. No significant changes to the design of the project shall be made without review and written approval by the staff on behalf of the Commission.

2. **Plan Review.** No work whatsoever shall be commenced pursuant to this authorization until final precise site, demolition, construction staging, engineering, architectural, grading, landscaping, and best management practices plans and any other relevant criteria, specifications, and plan information for that portion of the work have been submitted to, reviewed, and approved in writing by or on behalf of the Commission. Construction staging plans shall ensure that there is minimal impact to tidal marsh areas and public access areas, subject to Special Condition II-C below. The specific drawings and information required for approval will be determined by the Commission staff. Preliminary drawings should be submitted and approved prior to submission of final drawings.

   a. **Site, Architectural, and Public Access Plans**. All plans shall include and clearly label: the shoreline (Mean High Water Line or the inland edge of marsh vegetation up to 5 feet above Mean Sea Level where tidal marsh is present); the line 100 feet inland of the shoreline; property lines; Highway 101; East Bayshore Road; the boundaries of all areas to be reserved for public access purpose; and details showing the location, types, dimensions, and materials to be used for all structures, irrigation, landscaping, drainage, bollards, signs, lighting, fences, paths, trash containers, utilities and any other improvements.

b. **Engineering Plans**. Engineering plans shall include a complete set of construction drawings, specifications and design criteria. The design criteria shall be appropriate to the nature of the project and include the use of any structures, and soil and foundation conditions at the site. Final plans shall be signed by the professionals of record and be accompanied by:

   (1) Evidence that the design complies with all applicable codes; and

   (2) Evidence that a thorough and independent review of the design details, calculations, and construction drawings has been made.

c. **Preliminary and Final Plan Submital**. Not later than 60 days prior to planned commencement, plans shall be accompanied by a letter requesting plan approval and including: identifying the type of plans submitted; the portion of the project involved; and indicating whether the plans are final or preliminary. Approval or disapproval shall be based upon:

   (1) Completeness and accuracy of the plans in showing the features required above, particularly the shoreline, property lines, and the line 100-feet inland of the shoreline, and any other criteria required by this authorization;

   (2) Consistency of the plans with the terms and conditions of this authorization;

   (3) The provision of the amount and quality of public access to and along the shoreline and through the project to the shoreline required by this authorization, but limited to ensuring: (a) the public's use and enjoyment of the access area; (b) public safety; (c) accessiblity for persons with disabilities; (d) sufficient durability and maintenance of materials and structures; and (e) that the access is clear and continuous and encourages public use;

   (4) Whether the fill in the Bay does not exceed this authorization and will consist of approprate shoreline protection materials as determined by or on behalf of the Commission;

   (5) Whether the appropriate provisions have been incorporated for safety in case of seismic event;

   (6) Whether the placement of fill in the Bay will avoid or minimize impacts to the Bay and adjacent tidal marsh habitats;

   (7) Whether the appropriate elevations will be achieved to minimize overtopping, flooding, and 100-year storm events in all public access areas; and

(8) Assuring that existing public access will not be impeded during construction to the maximum extent feasible and if temporaray closure is necessary, the permittee shall provide information, for staff review and approval, on the period of time for the temporary closure and a timeline for reopening the public access.

Plan review shall be completed by or on behalf of the Commission within 45 days after receipt of the plans to be reviewed.

3. **Conformity with Final Approved Plans**. All work, improvements, and uses shall conform to the final approved plans. Prior to any use of the facilities authorized herein, the appropriate design professional(s) of record shall certify in writing to the Commission that, through personal review, the work covered by the authorization has been performed in accordance with the approved design criteria and in substantial conformance with the approved plans. No noticeable changes shall be made thereafter to any final plans or to the exterior of any constructed structure, plantings, trails, signage, or shoreline protection work without first obtaining written approval of the change(s) by or on behalf of the Commission.

4. **Discrepancies between Approved Plans and Special Conditions**. In case of any discrepancy between final approved plans and Special Conditions of this authorization or legal instruments approved pursuant to this authorization, the Special Condition or the legal instrument shall prevail. The permittee is responsible for assuring that all plans accurately and fully reflect the Special Conditions herein and any legal instruments submitted pursuant to this authorization.

5. **Appeals of Plan Review Decisions**. Any plan approval, conditional plan approval or plan denial may be appealed by the permittee or any other interested party to the Design Review Board, the Engineering Review Board, or if necessary, subsequently to the Commission. Such appeals must be submitted to the Executive Director within 30 days of the plan review action and must include the specific reasons for appeal. The Design Review Board shall hold a public hearing and act on the appeal within 60 days of the receipt of the appeal. If subsequently appealed to the Commission, the Commission shall hold a public hearing and act on the appeal within 90 days of the receipt of the subsequent appeal.

B. **Construction Operations.**

1. **Testing Imported Soils.** Prior to importing soils for fill that would come into contact with waters of the Bay, all soils shall be tested for elevated levels of contaminants in accordance with the provisions of the Regional Water Quality Control Board's (Water Board) Conditional Water Quality Certification (WQC) issued on April 7, 2015. No soils found to have levels of contaminants above levels approved by the Water Board shall be imported to or utilized at the site.
2. **Best Management Practices.** The permittee shall also employ best management practices, such as use of: soil compaction; silt fences; dust control; cofferdams; water diversion pipes; minimizing impacts from human and vehicle traffic; revegetation and planting native species in impacted areas; and other practices to assure that material placed to enhance existing shoreline protection features and to create a new levee alignment will minimize impacts to the creek and tidal marsh habitat and inhabiting species. Special care should be given to ensure newly placed soils do not erode into the Bay.
3. **Marsh and Upland Plant Protection During Construction.** The work authorized by this permit shall be performed in a manner that will prevent, avoid, or minimize to the extent feasible, any significant adverse impact on any tidal marsh, other sensitive wetland resources, and existing native upland vegetation. If any unforeseen adverse impacts occur to any such areas as a result of the activities authorized herein, the permittee shall restore the area to its previous condition, including returning the disturbed area to its original elevation and soil composition and, if the area does not revegetate to its former condition within one year, the permittee shall seed all disturbed areas with appropriate vegetation consistent with plans approved by or on behalf of the Commission. The permittee shall employ measures to minimize impacts to wetland areas, such as: (a) minimizing all traffic in marsh/mudflat areas; (b) ensure that any imported fill material, soil amendments, gravel, etc. placed within 12 inches of the ground surface shall be free of vegetation and plant material; (c) carefully remove, store, and replace wetland vegetation that has been removed or "peeled back" from construction areas as soon as possible following construction; and (d) reuse stockpiled soil, where appropriate, for re-establishment of disturbed project areas following construction.
4. **Worker Education Program.** All proposed project construction staff shall be trained by a qualified biologist in identifying special status species within the project area, their habitats, and avoidance and minimization measures prior to any work being performed. The training shall include information on the salt

marsh harvest mouse, California Ridgway's rail, other sensitive species in the area and sensitive habitats in accordance with the United States Fish and Wildlife Service's (USFWS) Biological Opinion (BO) dated January 15, 2016.

5. **Construction Staging**. Staging areas for construction shall be generally located within the designated areas shown on the plan titled, "Staging Area Map," prepared by the San Francisquito Creek Joint Powers Authority in the "*Draft Biological and Essential Fish Habitat Assessment for the San Francisquito Creek Flood Reduction, Ecosystem Restoration, and Recreation Project San Francisco Bay to Highway 101*" (November 2012; ICF International) and be in accordance with methods specified in the National Marine Fisheries Service (NMFS) Biological Opinion (BO) dated December 30, 2015, USFWS BO dated January 15, 2016, and the California Department of Fish and Wildlife (CDFW) Streambed Alteration Agreement (SAA) dated February 9, 2016. All work areas shall be appropriately screened and fenced and any on-land construction equipment shall be operated in a manner to ensure that impacts to public access areas and adjacent baylands are minimized.
6. **Removal of Temporary Fill.** All temporary fill (including cofferdams, construction equipment, diversion pipes, rock placed as energy dissipaters, and other necessary construction materials) placed within the Commission's jurisdiction during construction shall be removed no more than 30 days following the end of construction activities during each year of construction or if more time is needed, the permittee shall notify Commission staff in writing and substantiate the time period required and shall obtain staff approval.
7. **Debris Removal.** All construction operations shall be performed to prevent construction materials from falling into the Bay. In the event that such material escapes or is placed in an area subject to tidal action of the Bay, the permittee shall immediately retrieve and remove such material at their expense.
8. **Certification of Contractor Review.** Prior to commencing any grading, demolition, or construction, the general contractor or contractors in charge of that portion of the work shall submit written certification that s/he has reviewed and understands the requirements of the permit and the final BCDC-approved plans, particularly as they pertain to any public access or open space required herein, or environmentally sensitive areas.

C. **San Francisquito Creek Widening.** The permittee shall remove a maximum of a 3-feet thick layer of sediment along the creek edges and shall utilize equipment that minimizes impacts to the surrounding creek and marsh habitats. All material shall be disposed or placed at an appropriate location outside the Commission's jurisdiction.

1. **Dewatering Plan.** Prior to in-stream construction, the permittee shall submit for Commission review a Dewatering Plan that includes a Surface Water Diversion Plan and Groundwater Management Plan, best management practices to ensure that groundwater flows are appropriately pumped, contained, and meet applicable water quality objectives before discharging the flow back into the creek downstream of the cofferdam.

2. **In-Stream Construction.** The permittee shall install cofferdams during all work in tidal areas the creek. Discharge waters coming from the cofferdam bypass pipes shall not exceed particulate limits defined in the USFWS BO dated January 15, 2016 and the Water Board's WQC dated April 7, 2015.

3. **Water Quality Best Management Practices.** In order to minimize impacts to natural resources, the permittee shall implement the mitigation measures, best management practices and other conditions required in its approved WQC dated April 7, 2015 and shall be in compliance with the Statewide National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges of Stormwater Associated with Construction Activities, and an approved Storm Water Pollution Prevention Plan. Prior to beginning construction, the permittee shall obtain final written approval for the project construction from the Executive Officer of the Water Board and submit a copy of this approval to the Commission staff.

4. **Hazardous Material/Spill Prevention.** The permittee shall implement measures contained in an approved hazardous material/spill prevention plan. If hazardous materials are released into waters of the State during construction activities, the permittee shall implement clean up procedures identified in the approved plan and notify Commission staff within 48 hours.

D. **Marsh Restoration Work and Plans**

1. **Marsh Restoration Plan**. Within 90 days of issuance of this permit, the permittee shall work with the Commission staff and the Resource Agencies to finalize and submit the *Mitigation and Monitoring Plan* (MMP), including the marsh restoration and enhancement plan and program for review and approval by Commission staff. The MMP shall include, at a minimum, the following information:

a. **Site Conditions and Modifications.** A topographic map of the site in one-foot contours and a topographic map showing the proposed modifications. All elevations shall be relative to National Geodetic Vertical Datum (NGVD88).

(1) Within San Francisquito Creek, the plan shall include typical cross-sections showing proposed final elevation of marsh plain and creek channel, and any high spots. The plans shall show: (a) figures for the ratios of typical horizontal to vertical slopes for existing and proposed marsh surface, channels, and sloughs; (b) proposed plant species along the cross-sections according to their expected zone of growth; (c) the elevation of adjacent surrounding levees; and (d) the estimated tidal range related to Mean Higher High Water, Mean High Water, Mean Lower Low Water, Mean Sea Level, the maximum predicted tide, and the 100-year tide.

(2) Within and adjacent to Faber Tract Marsh, the plan shall include typical cross-sections showing proposed final elevation of marsh plain, transitional habitat along the levee toe, degraded levee (outer Faber Tract) and marsh mounds. The plans shall show: (a) figures for the ratios of typical horizontal to vertical slopes for existing and proposed transitional habitat adjacent to the levees, the degraded levee; (b) location of the marsh mounds; proposed plant species along the cross-sections according to their expected zone of growth; (c) the elevation of adjacent surrounding levees; and (d) the estimated tidal range related to Mean Higher High Water, Mean High Water, Mean Lower Low Water, Mean Sea Level, the maximum predicted tide, and the 100-year tide.

b. **Plantings and Revegetation Plan.** The plan shall maximize the use of native plants consistent with the adjacent baylands and high profile marsh vegetation; and shall utilize appropriate native mix erosion-control seed mixes where appropriate, such as levee slopes.

c. **Identification of a Suitable Reference Site**. The plan shall include appropriate, nearby reference sites for evaluating the progress of the restoration and enhancement site that shall be used as a comparison site in the monitoring program.

d. **Soil and Water Information**. The restoration program shall include a report identifying the type of soils found at the site and the soil type of any fill to be imported to the site, including all necessary sediment testing required under the Water Board's WQC. Information shall be provided on the quantitative soil measurements of salinity, pH, organic content, and bulk density. All imported soils must be within 10% of the range of values found at the "reference marsh" for soil qualities such as grain size, organic content, salinity, and pH. Information shall also be provided on the water, including water analysis of salinity, pH, biochemical oxygen demand (BOD), dissolved oxygen (DO), and, if appropriate, heavy metals.

e. **Schedule.** The plan shall include a construction, planting and temporary fill removal schedule consistent with water quality and wildlife protections described herein.

f. **Invasive Species Control**. The plan shall include appropriate measures to prevent the spread of invasive plants. Undesirable exotic plant species such as pepperweed (*Lepidium latifolium*), *Spartina alterniflora*, broom, or star thistle shall be reasonably controlled (coverage of less than 5 percent of the expected zone of growth) during the first five years or until invasive plants are eliminated in 90% of the site.

2. **Monitoring**. Beginning February 1, 2018, and each February in years following, the permittee shall report to the Commission on the success of the project in restoring tidal marsh and transition zone habitats at the locations identified in the approved MMP. The monitoring period shall last for a minimum of five years, and continuing until those portions of the restoration site subject to tidal action meet the designated success criteria as specified in the MMP as compared with nearby reference marshes, or for up to ten years, whichever occurs first. Monitoring shall generally occur between September 1st and December 1st as specificied in the USFWS BO.

   The permittee shall submit annual reports and a final comprehensive report that includes the percentage of the site revegetated, plant survival rates, invasive species coverage, approximate percentage representation of different plant species, and a qualitative assessment of plant growth rates for the all tidal and creek restoration areas, including adjacent transition zone habitats.

   The permittee shall monitor the success of high tide refuge islands for a minimum of five years and generally in accordance with an MMP approved by or on behalf of the Commission.

   Should adverse conditions be identified during the five years of monitoring following construction, the permittee shall take corrective action, in a reasonable period of time, as specified by or on behalf of the Commission. Once corrective actions have occurred, the permittee shall commence additional monitoring as specified by the Commission to identify additional issues or find the project has met its success criteria.

3. **Restoration Plan Submittal and Review.** At least 60 days prior to the commencement of any work at any location pursuant to this authorization, the permittee shall submit the *Mitigation and Monitoring Plan* (MMP), which includes the marsh restoration and enhancement plan and program, to be approved by or on behalf of the Commission for the restoration and enhancement of areas within and along the San Francisquito Creek and adjacent to Faber Tract Marsh. The tidal marsh restoration and berm enhancement program shall consist of not less than 9.44 acres of restored habitat areas.

4. **Marsh Restoration Work.** Prior to the completion of all construction activities authorized herein, the permittee shall undertake all necessary grading, installation of temporary irrigation, planting of marsh plants and monitoring, generally in accordance with the final approved *Mitigation and Monitoring Plan* as approved by or on behalf of the Commission as described above.

E. **Minimize Impacts to Wildlife.** In order to minimize impacts to listed and special status species, the permittee shall, to the maximum extent feasible, take all precautions to avoid adverse impacts to the California Ridgeway's rail, California black rail, salt marsh harvest mouse, green sturgeon, longfin smelt, steelhead, and California red-legged frog and other species of concern that may occur in the project area. The permittee shall employ the conservation measures outlined in its permit application and subsequent submittals, and adhere to the avoidance and minimization measures identified in the CDFW SAA dated February 9, 2016, the conservation measures in the USFWS BO dated January 15, 2016, and the reasonable and prudent measures identified in the NMFS BO and Incidental Take Statement. All construction activities within San Francisquito Creek shall occur between June 15th through October 15th of any year and work outside the creek shall occur between May 1st and October 15th of any year, unless an extension of time is requested by the permittee in writing and is approved on behalf of the Commission.

   1. **Biological Monitors.** The permittee shall employ a qualified biologist(s) to conduct onsite monitoring during construction activities for potential impacts to California red-legged frog, San Francisco garter snake, California Ridgway's rail, California black rail and salt marsh harvest mouse, special status plant species and their habitat.

2. The permittee shall be responsible for implementing the following minimization measures specific to species protection for work in and adjacent to Faber Tract Marsh:

   a. **California Ridgway's Rail:**

      (1) For any work performed during the Ridgway's rail breeding season (February 1st through August 31st), weekly call counts shall be conducted each year during the rail courting period;

      (2) Surveys shall be coordinated with the USFWS, but will generally follow the protocols outlined in the USFWS BO, dated January 15, 2016;

      (3) A 700-foot-wide buffer shall be maintained at active Ridgway's rail nest sites and be monitored by a qualified biologist; and

      (4) All activity near the buffer area shall be evaluated by the field biologist in an effort to eliminate any possible disturbance of adult or juvenile birds.

   b. **Salt Marsh Harvest Mouse:**

      (1) Installation of mouse exclusion fencing around the defined work area following any vegetation removal; and

      (2) Any work within 300 feet of tidal or pickleweed habitats shall have a biologist inspect the work area and adjacent habitats to determine if salt marsh harvest mice are present and the biologist shall remain on site to monitor during operations.

3. **Endangered Species Siting.** No work shall be performed if the qualified biologist determines that any California Ridgway's rail, California black rail, or salt marsh harvest mouse is within the work area. Any individual of these listed species that is found within the work area shall be allowed to leave the work area of its own volition.

4. **Work Limitation.** No work shall occur within 2 hours of extreme high tides (6.5 feet NAVD88 or above) within the habitats of the California Ridgway's rail, California black rail, and salt marsh harvest mouse habitat.

5. **Limits for Pesticide and Herbicide Use.** The permittee shall not utilize rodenticides or fumigants within 328 feet of suitable habitat for the salt marsh harvest mouse or California Ridgway's rail. All herbicides shall be in compliance with the State-certified applicators and under the direction of a licensed Pest Control Advisor. Only herbicides and surfactants approved for aquatic use shall be applied to the channel/creek banks and within 20 feet of any water present

on site. Aquatic herbicide use shall be limited to use from between **July 1st through October 15th** in accordance with the USFWS BO dated January 15, 2016 and the CDFW SAA dated February 9, 2016.

6. **Protection of Nesting Shorebirds.** Migratory bird nesting surveys shall be performed prior to any proposed project-related activities that may impact nesting migratory species (nesting season between January 15th and September 1st) in accordance with the USFWS BO and the CDFW SAA.

7. **Predator Control.** The permittee shall develop and implement a predator control program for controlling predators around and within the marsh and shall submit a copy of the plan to Commission staff for approval.

F. **Mitigation**. To mitigate for impacts to species and habitat, the permittee shall construct the following habitat features. These features shall be constructed as authorized in Section I-A herein and as depicted on final plans and specifications approved pursuant to Special Condition II-A, herein.

1. **High Tide Refuge Islands.** Within two years of project commencement, the permittee shall construct at least five high tide refuge islands.

2. **Steelhead Passage Features.** As part of the widening and restoration of San Francisquito Creek, the permittee shall construct steelhead high flow refugia features. These features shall be constructed concurrently with the creek restoration and not later than October 15, 2017. The steelhead high flow refugia shall be constructed with either quarry rock, tree rootwads or other inert material approved by or on behalf of the Commission.

3. **Tidal Marsh Restoration.** To mitigate for both the temporary impacts and permanent loss of marsh, the permittee shall restore a minimum of 3.44 acres of high marsh and high marsh transition habitats within the Commission's jurisdiction. The restoration work shall occur concurrently with the project to the maximum extent feasible and must be commenced by August 1, 2017 or a later date approved by Commission staff. By, August 31, 2016, the permittee shall submit plans for the preparation, planting, establishment care, and monitoring of these of tidal marsh restoration areas for review and approval by Commission staff.

4. **Faber Marsh Berm Enhancements**. By December 30, 2018, the permittee shall construct all berm enhancements in and around Faber Marsh, unless a later completion date is approved by Commission staff. By August 31, 2016, the permittee shall submit plans for the preparation, planting, establishment, care, and monitoring of Faber Marsh Berm Enhancements as described in the USFWS BO dated January 15, 2016.

G. **Public Access**

1. **Total Area.** The public access provided by this project shall total approximately 209,120 square feet (4.8 acres), of which approximately 47,500 square feet will be new public access added as part of this project to the currently existing public access, both inside and outside the Commission's jurisdiction, and shall be made available exclusively to the public for unrestricted public access for walking, bicycling, viewing, and related purposes. All public access improvements including, but not limited to, trail alignments (including configuration and dimensions), benches, overlook improvements, signage, railings, trash containers, fencing and interpretive exhibits shall be subject to final plan review approval pursuant to Special Condition II-A of this permit. On limited and rare occasions, if the permittee wishes to use the required public access areas for uses other than the uses described above, such as extended closures for levee maintenance or repair, the permittee must obtain written approval by or on behalf of the Commission at least 30 days prior to such use of the public access area.

2. **Public Access Improvements.** No later than six months after substantially completing levee realignments and improvements authorized herein, or by October 15, 2018, whichever is sooner, the permittee shall install the following public access improvements, as generally shown on Exhibit D, and make the improvements available exclusively to the public for unrestricted public access:

   a. **Improvements within the Commission's jurisdiction shall include:**

      (1) Remove approximately 700 linear feet of existing paved Bay Trail running along the existing SFC south levee and realign approximately 600 linear feet of the paved public access trail along the new realigned SFC south levee. The new trail shall be a minimum of 10 feet wide and may be up to 16 feet wide;

      (2) Construct an approximately 202-linear-foot, 10-foot-wide, wooden, pile-supported boardwalk across the newly widened San Francisquito Creek (from the realigned SFC south levee to Friendship Island), connecting sections of the Bay Trail on the north and south sides of the project area;

      (3) Install and maintain two approximately, 250-square-foot overlook areas (one on each end of the boardwalk connecting Friendship Island and the SFC south levee) with overlook improvements such as, bicycle pull-out spaces and benches, and install and maintain interpretive signage related to Faber Tract Marsh near the overlook areas;

(4) Place compacted aggregate (4-inch minimum depth), such as decomposed granite, on portions of the trail north of Friendship Bridge and near the O'Connor Pump Station.

b. **Improvements Within the Total Public Access Area**. Prior to the completion of the project authorized herein, the permittee shall install the following improvements, as generally shown on the attached Exhibit D:

(1) Approximately 2,500 linear feet of asphalt paved trail running from the new boardwalk connection on the SFC south levee top to the Geng Road access point. The trail shall be a minimum of 10 feet wide and may be up to 16 feet wide in some locations;

(2) Approximately 1,590 linear feet of compacted aggregate (4-inch minimum depth) trail running along the SFC south levee from about the Geng Road access point to the end of the project constructed trail, which connects to an existing 220-foot section of pavement near East Bayshore Road (on the SFC south levee near the East Bayshore Road access point). The trail shall be a minimum of 12 feet wide and may be up to 16 feet wide in some locations;

(3) Approximately 3,070 linear feet of compacted aggregate (4-inch minimum depth) trail, such as decomposed granite, along the top of the SFC north levee extending from the O'Connor Pump Station to East Bayshore Road. A small portion (1,450 linear feet) of the SFC north levee trail near Daphne Way will remain as the existing earthen trail. The trails must be a minimum of 12 feet wide and may be up to 16 feet wide in some locations;

(4) Install and maintain no fewer than seven BCDC public shoreline signs placed at approved locations. There shall be one sign located near each of the trail access points generally shown on Exhibit D, and one sign placed near the intersection of Geng Road and Embarcadero Road in the City of Palo Alto to direct public access users to the trail;

(5) Establish new formal access points for the trail by providing public access improvements at Verbena Drive, Daphne Way, and East Bayshore Road (on both the SFC north and SFC south levees) that shall include signage, and any other public access improvements needed to clearly identify the access points for the public and to prevent unauthorized use of the trail; and

(6) Install bollards and other public access improvement near the O'Connor Pump Station and Geng Road access points to prevent unauthorized vehicles from entering the public access area.

Such improvements shall be consistent with the plans approved pursuant to Condition II - A of this authorization and generally conform to the areas shown on Exhibit D of this authorization.

3. **Fencing Impacts on Public Access.** The permittee shall submit plans for all fencing proposed, including predator exclusion fencing, as part of the project, which shall undergo plan review per Special Condition II – A above. The permittee shall discuss design considerations (dimensions, height, fencing type, etc.) with staff during planning and gain staff approval through plan review prior to constructing any permanent fencing on the project site. The permittee shall utilize fencing materials that maximize views to the Bay and surroundings from the public access corridors to the maximum extent feasible.
4. **Temporary Closure of Public Access.** The permittee shall place appropriate signage on either side of construction areas, as needed, to alert the public of the work, advising caution and potential delays, indicating when public access areas may be closed, cleared, and re-opened, and indicating the location of alternative routes around the construction project to access the Bay Trail. The permittee shall provide alternative routes around construction zones when possible and ensure that appropriate signage and personnel are on-site to re-route the public around any portion of the public access areas that may be closed during construction activities.
5. **Reasonable Rules and Restrictions.** The permittee may impose reasonable rules and restrictions for the use of the public access areas to correct particular problems that may arise. Such limitations, rules, and restrictions shall have first been approved by or on behalf of the Commission upon a finding that the proposed rules will not significantly affect the public nature of the area, will not unduly interfere with reasonable public use of the public access areas, and will tend to correct a specific problem that the permittee have both identified and substantiated. Rules may include restricting hours of use and delineating appropriate behavior.
6. **Maintenance of Public Access Improvements.** The areas and improvements within the 209,120 square feet (4.8 acres) public access area described above shall be permanently maintained by and at the expense of the permittee or their assignees. Such maintenance shall include, but is not limited to: repairs to all path surfaces; replacement of any plant materials that die or become unkempt; repairs or replacement as needed of any public access amenities such as signs, benches, bollards, etc.; periodic cleanup of litter and other materials deposited within the access areas; removal of any encroachments into the public access areas; assurance that the public access signs remain in place and visible; and repairs to any public access areas or improvements that are damaged by future

subsidence or uneven settlement, or flooding, or inundation caused by sea level rise, including raising land elevations or redesigning public access features to protect and ensure the usability of the public access areas and improvements at all times. Within 30 days after notification by staff, or a longer period of time requested by the permittee and approved by Commission staff, the permittee shall correct any maintenance deficiency noted in a staff inspection of the site. The permittee shall obtain approval by or on behalf of the Commission of any maintenance that involves more than in-kind repair and replacement.

7. **Assignment.** The permittee shall transfer maintenance responsibility to a public agency or another party acceptable to the Commission at such time as the property transfers to a new party in interest but only provided that the transferee agrees in writing, acceptable to counsel for the Commission, to be bound by all terms and conditions of this permit.

H. **Riprap and Shoreline Protection.** Riprap placed within the project site shall be either quarry rock or specially cast or carefully selected concrete pieces free of reinforcing steel and other extraneous material and conforming to quality requirements for specific gravity, absorption, and durability specified by the California Department of Transportation or the U. S. Army Corps of Engineers. The material shall be generally spheroid-shaped. Use of dirt, small concrete rubble, concrete pieces with exposed rebar, large and odd shaped pieces of concrete, and asphalt concrete as riprap is prohibited.

1. **Placement.** Riprap material shall be placed so that a permanent shoreline with a minimum amount of fill is established by means of an engineered slope not steeper than two (horizontal) to one (vertical) unless slope is keyed at the toe. The slope shall be created by the placement of a filter layer protected by riprap material of sufficient size to withstand wind and wave generated forces at the site. Further, all rock-slope projections shall be in a manner that minimizes spaces between the rocks that may provide predator denning areas in accordance with the USFWS BO dated January 15, 2016.

2. **Design.** Professionals knowledgeable of the Commission's concerns, such as civil engineers experienced in coastal processes, should participate in the design of the shoreline protection improvement authorized herein.

3. **Maintenance.** The shoreline protection improvements authorized herein shall be regularly maintained by, and at the expense of the permittee(s), any assignee, or other successor in interest to the project. Maintenance shall include, but not be limited to, collecting any riprap materials that become dislodged and repositioning them in appropriate locations within the riprap covered areas, replacing in-kind riprap material that is lost, repairing the required filter fabric as

needed, and removing debris that collects on top of the riprap. Within 30 days after notification by the staff of the Commission, the permittee(s) or any successor or assignee shall correct any maintenance deficiency noted by the staff.

I. **Levee and Floodwall Maintenance Restrictions.** The levees and floodwall improvements authorized herein shall be regularly maintained by, and at the expense of the permittee(s), any assignee, or other successor in interest to the project. Maintenance shall include, but not be limited to, replacing in-kind material that is lost, repairing degraded portions of the levees and/or floodwalls as needed, and removing debris that collects on the levees and near floodwalls. Within 30 days after notification Commission staff, the permittee(s) or any successor or assignee shall correct any maintenance deficiency noted by the staff. Further maintenance limitations for all levees authorized herein include:

1. **Rodent control.** No rodenticides shall be used in areas within or adjacent to known and potential habitat for salt marsh harvest mouse and Ridgway's rail. In areas near suitable habitats for the salt marsh harvest mouse and Ridgway's rail, the permittee shall use only live traps to control rodents in compliance with the USFWS BO and CDFW SAA. In the event that a listed species becomes trapped, the appropriate Resource Agencies should be contacted for instructions regarding release or care for the animal.
2. **Levee mowing for Operations and Maintenance.** The grassland habitat along the San Francisquito Creek levee slopes up shall be mowed not more than three times per year to maintain acceptable roughness and prevent fire hazards. However, prior to mowing, the permittee shall conduct cutting of vegetation in accordance with USFWS BO dated January 15, 2016 and the CDFW SAA dated February 9, 2016.
3. **Transfer of Maintenance Responsibility**. Operation and maintenance, of the levees only, may be transferred to the Santa Clara Valley Water District Stream Maintenance Program (SMP) upon approval of the SMP by or on behalf of the Commission.

J. **Creosote Treated Wood**. No pilings or other wood structures that have been pressure treated with creosote shall be used in any area subject to tidal action in the Bay or any certain waterway, in any salt pond, or in any managed wetland within the Commission's jurisdiction as part of the project authorized herein.

III. Findings and Declarations

This authorization is given on the basis of the Commission's findings and declarations that the work authorized herein is consistent with the McAteer-Petris Act, the *San Francisco Bay Plan* (Bay Plan), the California Environmental Quality Act (CEQA), and the Commission's amended coastal zone management program for San Francisco Bay for the following reasons:

A. **Bay Fill.** The Commission may allow fill only when it meets the requirements identified in the McAteer-Petris Act Section 66605, which states, in part, that: "[(a)] the public benefits from fill in the Bay should be authorized when public benefits from fill clearly exceed public detriment from the loss of water areas, fill should be limited to water-oriented uses or minor fill for improving shoreline appearance and public access; (b) there is no alternative upland location; (c) the fill is the minimum amount necessary; (d) the fill is designed to minimize harmful effects to the Bay Area, including reducing impacts to water circulation, water quality, marshes and wildlife, and other conditions of the environment; (e) that the fill should be constructed in accordance with sound safety standards, which offer protection to persons and property against the hazards of unstable geologic or soil conditions or of flood or storm waters; (f) authorized fill should establish a permanent shoreline; and (g) the fill should be authorized only when the applicant has valid title."

   The project would result in the net placement of approximately 24,000 square feet of new permanent fill in the Bay for a variety of uses, including those related to stabilization and protection of existing levees along the creek, construction of a floodwall (part of which is in the Commission's jurisdiction), construction of a new pile-supported boardwalk, replacement of utility lines, creation of high tide refugia islands in the Outer Faber Marsh, placement of in-stream fish high flow refugia structures (steelhead passage features), and protection of bridge footings/abutments located within the streambed. Solid fill placed on the outboard side of the SFC north levee in Outer Faber Tract would be primarily for the creation of high tide refugia (Exhibit D). Fill for public access within the Bay would include approximately 2,062 square feet of the fill for the new wooden, pile-supported boardwalk over newly created open-water area and tidal marsh terrace within the Commission's future Bay jurisdiction. The Commission's Bay and shoreline band jurisdictions will be expanded as a result of the project.

   Placement of temporary fill includes cofferdams, water diversion pipes, and energy dissipaters to dewater and divert stream flows from upstream during the in-channel construction period. Approximately 12,810 square feet of temporary fill, necessary for the construction of a temporary cofferdam and water diversion structure, would be placed within the creek. The cofferdam would consist of sheet piles driven approximately 20 feet deep into the channel. A 36-inch HDPE diversion pipe would run along the surface of the Faber Tract Marsh (1,850 feet long, 1,940 cy of fill) temporarily covering about 5,550 square feet of the marsh. At the end of the diversion pipe, a rock energy dissipater would be constructed within the channel, resulting in approximately 540 cy of temporary solid fill (7,260 square feet). The pipes and the rock energy dissipater would be removed at the end of each construction, June through October, and stored outside BCDC's jurisdiction.

1. **Public Benefit**. The existing shoreline and creek consists of an undersized flood protection channel; flood protection levees in need of repair; and an existing marsh that lacks connection to the creek and has limited existing high tide refugia for certain species. In addition, levees on the north side of the creek are lower than the other side creating a greater flood risk for East Palo Alto, and an inadequate level of flood protection exists for the current and future conditions as evidenced by recent flood events. Currently, the lower portion of the creek is constrained, and partially filled with sediment, reducing flood capacity. Degrading the levee along the Outer Faber Marsh will reduce the constriction point near the Bay and reduce flood elevations further upstream during high flows.

   The Faber Tract Marsh is bordered on four sides by levees or earthen berms that restrict fluvial and tidal exchange of sediment into the marsh. The marsh has limited existing transition zones and high tide refugia, so the highest tides fully inundate the marsh. During high tides, wildlife, including two federally- and state-listed species, must move to the edges of the marsh where predation rates can be high. The fill placed within the marsh to create high tide refugia islands and along the edges to provide additional transitional space at the toe of the levee will provide much needed opportunities for species to reach higher elevations during high tides.

   The Commission finds that the public benefits associated with the fill placed within the Commission's jurisdiction to enhance existing levees and widen the creek to protect inland areas from flooding exceeds the public detriment from its placement. Additionally, the Commission finds that fill placed for high tide and transition zone habitats will provide a significant public benefit by supporting native Bay species, especially those with critical population issues associated with habitat loss.

2. **Water Oriented Use.** Within the Commission's jurisdiction, approximately 30,000 square feet of fill is proposed within the Commission's Bay and 100-foot shoreline band jurisdictions for the purpose of flood protection. While not explicitly described as a "water oriented use" by the McAteer-Petris Act, shoreline protection systems, have been authorized in numerous locations around the Bay by the Commission, and have been found to be a water-oriented

use. The Bay Plan has an entire section with findings and policies on Shoreline Projection in the Bay. Finding (b) of the Commission's Shoreline Protection policies recognizes that, "[m]ost structural shoreline protection projects involve some fill…." The primary purpose of much of the proposed project elements that include fill, is to provide upstream flood protection for residents within the City of East Palo Alto and to provide protection to property owners in the City of Palo Alto by reinforcing, realigning or enhancing existing levees.

The Commission finds that the fill associated with the project (riprap and earthen fill) protects residents against flooding and serves a water-oriented use similar to other shoreline protection systems approved by the Commission.

3. **Alternative Upland Location.** The flood control project is designed to protect residents in the floodplain from flooding. There is no alternative upland location for the fill proposed in the channel because shoreline protection features are necessary for the basic project purpose and need. In addition to flood protection, the project has other goals, including habitat enhancement, restoration, and creating upland refugia. Faber Tract Marsh would be subject to more frequent flooding events after the lowering of the levee between the San Francisquito Creek and the Outer Faber Marsh, and therefore, the proposed fill is necessary to provide higher elevation refugia for Ridgway's Rail and salt marsh harvest mice that live there.

   The Commission finds that there is no alternative upland location for the riprap and earthen fill needed to protect levees from erosion and protect residents from flooding. Additionally, the Commission finds that there is no alternative upland location for the earthen fill needed to provide high tide refugia, a necessary habitat feature for marsh dependent, special status species and to adapt to sea level rise.

4. **Minimum Amount Necessary**. The project will involve a net placement of approximately 24,000 square feet of new fill in the Commission's current and future Bay jurisdiction (Table 1). The permittee stated that this is the minimum amount of fill necessary to construct project elements and achieve the flood protection and habitat restoration goals of the project.

   Of the new Bay fill, approximately 18,240 square feet of solid fill, consisting of riprap and earthen fill, is necessary for protecting existing levees and reinforcing low sections of the outboard side of the SFC north levee; and protecting areas of Friendship Island from erosion. Due to the velocity of the water flowing through the channel during high flows, rock riprap is needed to maintain the levees in the channel as softer sediments would likely be washed out or eroded.

To connect the newly widened creek and the public access trails, approximately 2,060 square feet of the new pile-supported fill is needed to provide continuity along the trail. If this boardwalk is not provided, a gap would exist between the trail on the north and south sides of the creek.

As required by NMFS and CDFW, the project will also involve minor amounts of solid fill consisting of mainly rock (approximately 1,710 square feet) within the creek to create one of six high velocity refuge areas for migrating steelhead (five features are outside the Commission's jurisdiction). This refuge area would allow for individual steelhead and other fish species living within and traveling through the channel to have an area of respite. If the fish passage features were not created, steelhead migrating in the channel would not have the necessary quiet waters to rest and feed during migration, which could lead to the species abandoning this creek over time. Because these features are specifically designed for this purpose, the permittee has stated it is the minimum amount of fill necessary.

Additionally, approximately 1,250 square feet (110 cy) of the new fill will be for the creation of five high tide refugia islands in the Outer Faber Marsh. The permittee has stated that the fill is the minimum amount necessary to achieve the desired habitat features with minimal reduction in existing marsh habitat and to mitigate for temporary or permanent loss of high tide refuge areas resulting from the project. These features have been incorporated into the project as mitigation for habitat loss and species impacts and are required by the Resource Agencies.

The permittee will also be remove a minor amount of existing Bay fill (approximately 2,810 square feet) along the Outer Faber Marsh levee (Exhibit D) to restore the area to marsh plain elevation.

Because most of the fill placed as part of this project will be for shoreline protection, and minor amounts of fill is for public access along the shoreline and the creation of important habitat features for special status species, the Commission finds that this is the minimum amount of fill necessary to construct the project.

5. **Permanent Shoreline.** The fill placed along the levees as part of this project and within the Commission's Bay and shoreline band jurisdiction would bolster existing levees, increase channel flood capacity and protect the adjacent communities along the San Francisquito Creek from flood damage by protecting residents and the surrounding land from flooding that would occur during a 100-year storm event occurring at a time when the Bay experiences 26 inches of sea level rise in the future. In addition, the project would result in a net increase in

the Commission's Bay jurisdiction after the widening of the San Francisquito Creek is completed. The proposed design is anticipated to be a long-term solution that would establish a permanent shoreline until at least 2067. Beyond that date, project modifications and adaptations may be needed to further protect residents and adjacent properties from future conditions.

6. **Valid Title.** All work for the project, within BCDC's jurisdiction, would be conducted on property owned by the City of Palo Alto. The City of Palo Alto granted an easement for work on the proposed project to the Santa Clara Valley Water District, which is a member of the JPA.

For these reasons, the Commission finds that the fill placed during this project is the minimum amount necessary, has been designed and will be constructed to sounds safety standards, will establish a permanent shoreline and will minimize harmful impacts to the Bay Area.

B. **Natural Resources.** Within the Commission's jurisdiction, the project would impact approximately 2.19 acres of tidal marsh habitat and proposes to restore and enhance a total of 9.44 acres of tidal marsh, transition zone, and high tide refuge habitats. The project would: (1) widen the tidal creek by realigning an adjacent levee; (2) excavate upland habitat that has developed within the creek channel and restore tidal marsh along the edges of the channel; (3) fill small amounts of tidal marsh in the Faber Tract Marsh to create high tide refugia islands and enhance adjacent transitional areas to improve refuge habitat for the salt marsh harvest mouse and the Ridgway's Rail; (4) install fish velocity refuge features within creek using solid fill, such as large rock; and (5) place fill on the outboard side of the SFC north levee to reduce erosion of the levee toe during overtopping.

1. **Fish, Wildlife and Tidal Marsh Habitat.** The Bay Plan policies on Fish, Other Aquatic Organisms, and Wildlife state, in part, that "[t]o assure the benefits to fish, other aquatic organisms and wildlife for future generations... the Bay's tidal marshes, tidal flats, and subtidal habitat should be conserved, restored, and increased." Similarly, the Bay Plan policies on Tidal Marshes and Tidal flats state, in part, "[t]idal marshes and tidal flats should be conserved to the fullest possible extent. Filling, diking, and dredging projects that would substantially harm tidal marshes or tidal flats should be allowed only for purposes that provide substantial public benefits and only if there is no feasible alternative." These policies further state that any proposed projects in these areas, "[s]hould be thoroughly evaluated to determine the effect of the project on tidal marshes and tidal flats, and designed to minimize, and if feasible, avoid any harmful effects," and that "[p]rojects should be sited and designed to avoid, or if avoidance is

infeasible, minimize adverse impacts on any transition zone present...." The policies encourage that "shoreline projects should be designed to provide a transition zone between tidal and upland habitats."

Fish, Other Aquatic Organisms and Wildlife Policy 4 states that "[t]he Commission should consult with the California Department of Fish and Wildlife and the U.S. Fish and Wildlife Service or the National Marine Fisheries Service whenever a proposed project may adversely affect an endangered or threatened plant, fish, other aquatic organisms or wildlife species...and give appropriate consideration of (their) recommendations in order to avoid possible adverse impacts of a proposed project on fish, other aquatic organisms and wildlife habitat."

Tidal Marsh Policy 6 states, in part, that, "[a]ny ecosystem restoration project should include clear and specific long-term and short-term biological and physical goals, and success criteria, and a monitoring program to assess the sustainability of the project. Design and evaluation of the project should include analysis of: (a) how the system's adaptive capacity can be enhanced so that it is resilient to sea level rise and climate change; (b) the impact of the project on the Bay's sediment budget; ...(e) potential invasive species introduction, spread, and their control; (f) rates of colonization by vegetation; (g) the expected use of the site by fish, wildlife and other aquatic organisms and wildlife; ... and (i) site characterization. If success criteria are not met, appropriate adaptive measures should be taken."

Finally, Fish, Other Aquatic Organisms and Wildlife Policy 5 states that "[t]he Commission may permit a minor amount of fill or dredging in wildlife refuges, shown on the Plan Maps, necessary to enhance fish, other aquatic organisms and wildlife habitat or to provide public facilities for wildlife observation, interpretation and education." Tidal Marsh Policy 8 further states that "[b]ased upon scientific ecological analysis and consultation with the relevant federal and state resource agencies, a minor amount of fill may be authorized to enhance or restore fish, other aquatic organisms or wildlife habitat if the Commission finds that no other method of enhancement or restoration except filling is feasible...."

To assess the impacts to habitats and species, the project underwent a California Environmental Quality Act (CEQA) review, as well as review by the State and Federal Resource Agencies, resulting in the issuance of two Biological Opinions and a Streambed Alteration Agreement from CDFW.

a. **Creek Alteration**. As proposed, the project would alter the existing tidal creek habitat within the Commission's Bay and shoreline band jurisdictions by widening areas to increase flood flows. In the process, both tidal and riparian habitats would be affected through excavation of upland areas within the lower reach of the creek. The realignment of the channel would impact approximately 1.15 acres of tidal marsh habitat within BCDC's jurisdiction. The proposed excavation activities would remove approximately 1,470 cy of sediment within the channel and would temporarily impact 16,120 square feet of ruderal and high marsh habitat within the channel, but would restore elevations in the creek to approximately Mean Higher High Water (6.0-8.0 ft NAVD88, graded at approximately 30:1) and allow for passive revegetation of high marsh habitat along the channel edges. Additionally, transitional habitat would be constructed along the levee slopes within the Commission's jurisdiction. Post construction, the project would provide a total of 15.14 acres of tidal marsh and transition zone habitats over the full length of the lower reach of the creek, 1.74 acres of which are within the Commission's existing and future jurisdiction.

Once the creek is widened, it will include a low flow channel and a wider high flow channel, at appropriate elevations for normal and flood flows. The project will also create a new high tide marsh terrace area, between Friendship Island and the SFC south levee, within the widened creek, which would be planted with high marsh plants including alkali weed, saltgrass, alkali heath, marsh jaumea, and perennial pickleweed. The in-channel tidal marsh and transition zone habitats will improve habitat connectivity between the creek and surrounding baylands, enhancing ecosystem functionality.

Caltrans work upstream of the project site will widen the bridge over San Francisquito Creek, allowing additional flows into the project reach. This work could increase velocities within the channel and have the potential to impact steelhead. As discussed in more detail below, six "steelhead passage features" would be installed along the lower reach of San Francisquito Creek and consist mainly of rock and root wad materials. Of the six steelhead passage features, one high velocity refuge area would be located within the Commission's jurisdiction. This would provide desirable habitat features within the channel, which is expected to have long-term benefits for fish and wildlife species within the project area.

While the San Francisquito Creek could accommodate greater flood flows, the widened portion of the creek would not be expected to significantly impact the tidal hydrology and sediment movement within the Bay and would reduce upstream flood elevations.

Between June 15th through October 15th, in 2016 and 2017, the project would have temporary impacts to the channel and tidal hydrology during the in-stream construction window. During this period, temporary fill for construction, including placement of two cofferdams, one at the Bayward end of the channel and one upstream of the Commission's jurisdiction, would be necessary to dewater the creek and perform work. The construction would also require temporary use of a 36-inch HDPE water diversion pipe that would be routed along the outboard bank of the Faber Tract marsh levee to an energy dissipater (consisting mostly of rock) just downstream from the cofferdam. The energy dissipater would help prevent the erosion of channel banks due to outflow from the diversion pipe.

The project will have both temporary and permanent impacts on in-stream tidal marsh and transition zone habitats. Special Conditions II-B-1 through II-B-8 and Special Condition II-E have been included herein to ensure that the project utilizes best management practices during construction to minimize impacts to these habitat areas. Some minor amounts of temporary fill are required during construction, but Special Condition II-B-6 ensures that the permittee will remove all temporary fill and Special Condition II-B-3 ensures these impacted areas will be restored through either passive or active revegetation. Minor amounts of permanent fill are necessary to create habitat features for steelhead. The project will also create new tidal marsh within the creek, restore tidal marsh along the edges of the creek, and restore areas temporarily impacted by the project that are within the Commission's current and future jurisdictions. Special Condition II-F has been included herein to ensure that these habitat features are built in a reasonable amount of time after the in-stream construction on the project is complete. The project will result in the restoration of more tidal marsh and transition zone habitats within the creek than the amount of habitat impacted by the project.

The Commission finds that the project, in implementing best management practices and restoring affected habitat within the creek, has been designed and conditioned herein to minimize harmful impacts resulting from fill placement.

b. **Faber Tract Marsh**. The Faber Tract Marsh is a 95-acre tidal salt marsh situated along the north side of San Francisquito Creek, and supports one of the largest populations of California Ridgway's rail in the region. It is also part of the USFWS' designated Central/South San Francisco Bay Recovery Unit for the California Ridgway's rail, and therefore is considered an important and sensitive area. It also supports a significant population of salt marsh harvest mouse, black rails and other marsh dependent species. Currently, Faber Tract Marsh contains little elevation diversity and is primarily tidal salt marsh with a few salt pannes.

To restore flood protection along the creek and protect species living in Faber Tract Marsh, low spots on the SFC north levee adjacent to the marsh would be repaired. In reinforcing the SFC north levee, the toe of the levee would be widened into the marsh to create a new gentler slope at a 6H:1V ratio to reduce erosion of the levee and adjacent marsh during levee overtopping. The widening of the toe of the levee would provide transitional habitat between the marsh and levee, thereby providing an ecosystem enhancement that will support mid and high marsh habitats. The project would also degrade an unmaintained levee between San Francisquito Creek and Outer Faber Marsh (final elevation would be 8 feet NAVD88) to allow floodwater to flow into the marsh, near the mouth of the creek, to further reduce upstream flood elevations and provide greater habitat connectivity. The proposed project would impact approximately 1.04 acres of tidal marsh habitats within Faber Tract Marsh.

As part of the mitigation package proposed by the permittee, and agreed to by the Resource Agencies, the project would restore and create approximately 1.7 acres of tidal marsh and high marsh transition habitats within and around Faber Tract Marsh. The project would include the creation of up to five marsh mounds in the Outer Faber Tract to provide high tide refugia for special status species. These mounds would provide relief from high tides and increased inundation due to flooding and sea level rise over time. The marsh mounds would require approximately 1,250 square feet of total fill (0.006 acres footprint for each of the five islands) and be constructed using imported fill material free from vegetation or plant material. The constructed elevation of the refugia islands would be approximately 8.8 feet (NAVD88) and would be planted with high profile marsh vegetation that would allow California Ridgway's rails and salt marsh harvest mice to escape current king tides. The islands are anticipated to settle to a final elevation of about 8.4 feet (NAVD88) at five years post construction. The proposed fill volume for each island is similar to volumes that the Commission approved for the California State Coastal Conservancy to build high tide refugia habitat in other marsh locations around San Francisco Bay (BCDC Permit No. M2014.025.00) and was considered a minor amount of fill for habitat purposes.

Additionally, the permittee would provide approximately 6.0 acres of berm enhancements and revegetation of the levees surrounding Faber Tract Marsh (levees to the north, south and east of the marsh) to further provide high tide refuge areas for California Ridgway's rail and salt marsh harvest mouse. Berm enhancements would include removal of invasive species, planting of high marsh and transitional upland habitat necessary for these species, and monitoring of the revegetation efforts along these levees, as discussed below.

The levees surrounding Faber Tract Marsh and the high tide refugia islands would be planted with high marsh and transitional vegetation consistent with the levee locations and adjacent baylands. Planting vegetation is an important aspect of the project because the levees and boardwalks around the project site provide potential access for mammalian predators of the California Ridgway's rail and the salt marsh harvest mouse. Additionally, utility transmission towers and lines located within and adjacent to the marsh provide artificial perches and nesting platforms for raptors and other avian predators that may prey upon the Ridgway's rail and salt marsh harvest mouse. Predation rates are known to increase during extreme high tide events when appropriate cover is not available. The vegetation will provide an additional protective measure for these species during high tide. Together, this portion of the project would enhance approximately 7.7 acres of high marsh, transitional and high tide refugia habitats in and around Faber Tract Marsh.

Special Conditions II-B and II-C have been added herein to minimize the impacts of the project on tidal marsh habitats within and around Faber Tract Marsh. Additionally, Special Condition II-F has been added herein to ensure that habitat restoration/enhancements occur in a reasonable amount of time and within the construction period of the project. Special Condition II-D ensures that the permittee will monitor the success of the restoration efforts within the marsh. Special Conditions II-E-4 and II-E-7 have been added herein to further require protection of special status species from predation that may occur during high tides while the restoration of the high tide refuge habitat areas is underway.

Therefore, the Commission finds that the project as designed and conditioned herein will minimize impacts to Faber Tract Marsh and where impacts are unavoidable, the permittee will mitigate for the impacts through habitat restoration and will be responsible for monitoring the success of the restoration efforts.

c. **Wildlife.** Within the full project area, there are several state- and federally-listed species, or species of special concern that could be affected by the project, including Central California Coast steelhead, longfin smelt, California red-legged frog, green sturgeon, western snowy plover, black rail, salt marsh harvest mouse, California Ridgway's rail, San Francisco garter snake, California least tern, white-tailed kite, western pond turtle, western burrowing owl, northern harrier, San Francisco common yellowthroat, and Alameda song sparrow; other native and non-native fish species, and nesting birds. Within the Commission's jurisdiction, the species of concern excludes the fresh water species, such as the pond turtle and red-legged frog.

On December 30, 2015, NMFS issued a BO that determined that the proposed project is "not likely to jeopardize the continued existence of the threatened [Central California Coast] CCC steelhead (*Oncorhynchus mykiss*) or southern distinct population of green sturgeon, nor is it likely to adversely modify their critical habitat." However, NMFS determined that incidental take of CCC steelhead would occur during project construction, as juvenile steelhead are likely to be present during the dewatering of the site for construction. NMFS provided reasonable and prudent measures and conditions to minimize impacts to steelhead in the channel, which included measures to reduce harm during dewatering of the channel; monitoring and reporting of steelhead "take" during construction activities; building steelhead habitat complexity features (steelhead passage features) such as rock weirs or debris jams that offer refuge during future flood flows; and performing annual inspections of fish habitat features. Additionally, NMFS concluded that the proposed project "would adversely affect EFH [Essential Fish Habitat] for species managed within the Pacific Coast Groundfish and Coastal Pelagic Species Fishery Management Plans," specifically impacting Pacific Groundfish and Coastal Pelagic species that use the creek and adjacent subtidal areas. NMFS found that prey items within the project area for these coastal pelagic and groundfish species would likely take at least one year to re-establish in the area after construction activities have finished. NMFS provided conservation recommendations in the BO, which would avoid, minimize, or otherwise offset potential adverse effects on EFH. NMFS recommend in-kind compensatory mitigation at a ratio of 1:1 on-site or at a ratio of 3:1 if off-site to compensate for temporal impacts to EFH over an estimated 6.9 acres of channel habitat resulting from all construction activities during the proposed project. However, the permittee provided NMFS with further information describing how the project as designed will offset temporary impacts to EFH, and on February 4, 2016 NMFS agreed with the permittee's justification.

The USFWS issued a BO on January 15, 2016 and found that, while the project will occur in an area thought to be habitat for a number of federally-listed species, the project was "not likely to adversely" affect these species because many of the species have not been found in or around the project site or will not occur in this area during construction activities. In the BO, USFWS did provide general conservation measures for protected species in the project area, including general site construction, water quality measures, use of pesticides, limits on operation and maintenance of levees, and vegetation management.

The USFWS determined the project as proposed would result in potential impacts to the Ridgway's rail and salt marsh harvest mouse in the form of increased likelihood of predation from increased habitat inundation in Outer Faber Marsh and removal of the upland refugia along the Outer Faber levee. During the consultation phase, the permittee and the USFWS entered into discussions to reduce impacts to listed species, particularly in regards to the marsh habitat in Faber Tract Marsh. In the BO, the USFWS provided conservation measures specific to Ridgway's rail and salt marsh harvest mouse, which it determined when implemented would ensure that the proposed project would not be likely to jeopardize the continued existence of these species. The project would minimize impacts to these species through implementation of the conservation measures related to predator management, vegetation removal, creation and restoration of high tide refuge, and other measures. The BO also requires conditions related to construction of specific habitat features, and monitoring of these features.

The CDFW issued a Streambed Alteration Agreement (SAA) on February 9, 2016, in which CDFW determined that the proposed project "could substantially adversely affect existing fish or wildlife resources." CDFW prepared the SAA for the project, which includes measures to protect fish and wildlife species within the project area. Without implementation of protection measures identified in the SAA, CDFW believes that the project would result in permanent loss of natural bed or bank; channel profile widening; loss of bank stability during construction; increased bank erosion; accelerated channel scour; increased turbidity; changes in pH; short-term release of contaminants; short-term changes in dissolved oxygen, water temperature, and stream flow; dryback of stream channels; permanent loss of wetland vegetation; permanent decline in vegetative diversity; colonization by exotic plant species; change in stream flow; temporary impacts to stream due to dewatering activities; direct take of aquatic species from pumps; construction of trenches that can capture terrestrial and semi-aquatic organisms; temporary loss of wildlife connectivity to water source;

temporary loss of terrestrial animal species' travel routes due to construction; disturbance or mortality of terrestrial, aquatic, and semi-aquatic fish and wildlife species; and disturbance to nesting birds. However, the SAA includes avoidance and minimization measures to reduce impacts to state-listed species by requiring a number of construction best management practices, on site monitoring by a CDFW approved biologist, and a number of other minimization measures. Additionally, the SAA also requires mitigation for both temporary and permanent impacts to habitat as a result of the project. The SAA also includes a requirement for a finalized, approved MMP for all habitat mitigation work (habitat restoration, enhancement and creation).

Special Condition II-E has been added herein to ensure that the project is in compliance with the NMFS BO, USFWS BO, and CDFW SAA regarding special status species living within tidal marsh habitats. Special Condition II-D requires the submittal of a final Mitigation and Monitoring Plan and approval by or on behalf of the Commission. It also ensures that the MMP will be consistent with monitoring required by the Resource Agencies and will provide long-term monitoring of all habitat restoration elements authorized herein and assess whether the restoration sites have met the required success criteria.

The Commission finds that the fill placed as part of this project provides substantial public benefits by protecting the surrounding areas from flooding and that the project as designed and conditioned herein will minimize impacts to Bay species and tidal marsh habitats, within San Francisquito Creek and Faber Tract Marsh.

C. **Water Quality.** The Bay Plan policies on Water Quality state, in part that "Bay water pollution should be prevented to the greatest extent feasible. The Bay's tidal marshes, tidal flats, and water surface area and volume should be conserved and, whenever possible, restored and increased to protect and improve water quality." They further state that "the Commission should consider the recommendations, decisions, and advice and authority of ...the Regional Board," and that the Board's recommendations and decisions should be the basis for carrying out the Commission's water quality responsibilities. The policies also state that "New projects should be sited, designed, constructed and maintained to prevent or, if prevention is infeasible, to minimize the discharge of pollutants into the Bay...."

The project includes grading and the excavation of upland sediments within the channel to enhance flood capacity, restore marsh elevations and habitat functionality and connectivity in and around the project site. Through restoration and expansion of the lower reach of San Francisquito Creek, the project would result in a net increase in the surface area and volume of the Commission's Bay jurisdiction and improve the quality of tidal marsh habitat. The proposed project includes enhancement of local ecosystems, and an enlarged Bay/creek interface, which will improve the passage for steelhead migrating from the Bay into the creek and upper watershed.

As is typical of construction projects, potential sources of water pollution include the use of small amounts of hazardous materials such as fuels, oils, concrete and asphalt in the construction of the proposed project elements. The permittee has stated that they would work with the selected construction contractor to prepare a Storm Water Pollution Prevention Plan (SWPPP) and would provide it to the Commission when available. This plan would include construction best management practices to minimize construction related discharges into the creek, including construction debris, no use of chemically-treated wood in the channel, minimizing disturbance and removal of vegetation, and minimizing disturbance to the creek where possible.

Adjacent to the project site, a former landfill is located near the Palo Alto Baylands Athletic Center. In addition, a few underground storage tanks that may have contained petroleum hydrocarbons are located along the creek. Currently, an automotive repair business is located along the left bank of the creek. The Final EIR found that the project is not likely to encounter any of the above-mentioned potential sources of contamination because they are located outside of the construction footprint and therefore, the project would not result in soil and groundwater contamination.

On April 7, 2015, the Water Board issued a conditional Water Quality Certification (WQC) for the project. The WQC requires the permittee to provide a revised dewatering plan to address both surface water and groundwater management to ensure the proposed discharges would meet applicable water quality objectives and to further reduce potential for pollutants to enter the Bay. In addition, it requires the permittee to test any imported soil that would be placed below top of bank, on levees and at any other locations where it has the potential to discharge to the creek or other waters of the State to ensure it does not have elevated levels of contaminants.

Regarding the discharge of storm waters through the channel, the permittee is required to obtain coverage under the NPDES General Permit for the Discharges of Stormwater Associated with Construction Activity (Water Board Order No. DWQ-2009-0009 as amended by Orders Nos. 2010-0014-DWQ and 2012-006-DWQ).

To ensure potential water quality impacts are minimized, Special Conditions II-C-2 through II-C-4 and II-J herein require that the permittee comply with the Water Quality Certification issued by the Water Board. Additionally, Special Condition II-B-1 ensures that soils brought on site will not have elevated levels of contaminants, and that the permittee tests the soils proposed for use on site. Special Condition II-C-1 requires the permittee to submit an updated dewatering plan to the Commission for review prior to initiating construction activities.

The project will result in the restoration of tidal marsh and transition zone habitats and will increase the Bay's water surface area as a result of widening the creek. Further, the permittee will take measures to ensure hazardous materials are properly contained, and that soils brought on site will be free from contaminants. Therefore, the Commission finds that the project as designed and conditioned herein will prevent pollution to the greatest extent feasible and that the Bay's water quality will be maintained.

D. **Mitigation**. The Bay Plan policies on mitigation state that "[p]rojects should be designed to avoid adverse environmental impacts to Bay natural resources....Whenever adverse impacts cannot be avoided, they should be minimized to the greatest extent practicable... and when unavoidable adverse impacts occur, mitigation should be required." The mitigation policies also state, in part, that "Individual compensatory mitigation projects should be sited and designed within a Bay-wide ecological context, as close to the impact site as practicable to: (1) compensate for the adverse impacts; (2) ensure a high likelihood of long-term ecological success; and (3) support the improved health of the Bay ecological system...." Additionally, these policies state, "[t]he amount and type of compensatory mitigation should be determined for each mitigation project based on a clearly identified rationale and analysis of a number of metrics. Further, the mitigation should, be provided prior to, or concurrently with the occurrence of project impacts." The Commission's policies allow for compensatory mitigation when necessary, as part of a mitigation program and further describe the components of a proposed mitigation and monitoring plan necessary to ensure success.

The permittee describes the project's impacts within the Commission's jurisdictions as occurring in tidal portions of San Francisquito Creek and Faber Tract Marsh and seeks to mitigate for these impacts through a combination of habitat enhancements and restoration. As proposed, the project would impact a total of 2.19 acres of existing habitats, including: 1.15 acres of tidal marsh habitat impacts from the excavation of sediment and vegetation within the creek, and approximately 1.04 acres of both temporary and permanent impacts to tidal marsh within Faber Tract Marsh during the creation of the wider levee toe slope on the SFC north levee and within the marsh. In impacting these habitats, wildlife species that are dependent on these habitats are also impacted as described in the fish and wildlife section above.

1. **Proposed Mitigation**. Mitigation for these impacts is both proposed by the permittee in the draft *Mitigation and Monitoring Plan* (December 2015) (MMP) and required by the Resource Agencies and the Water Board. To compensate for the impacts to the tidal creek and in Faber Tract Marsh, the permittee has proposed to create 1.68 acres of new marsh habitat within the Commission's jurisdiction and restore 1.76 acres of tidal marsh habitat: for a total of 3.44 acres of tidal marsh and transition zone habitat restoration. In widening the creek, the project will provide a low flow channel with adjacent marsh plain benches that can accommodate flood flows, much like a natural creek would. This would improve the existing habitat and increase available low, medium and high marsh within the channel. This proposal is consistent with the requirements of the Water Board, USFWS and CDFW for mitigation of impacts to this portion of the project and is also subject to final approval and agreement by BCDC and these agencies.

   NMFS, CDFW, and the Water Board identified potential impacts to native steelhead that migrate up San Francisquito Creek annually to spawning grounds higher in the watershed. These agencies found that increased water flow and reduced resting areas (high flow refugia) could impact this listed species as well as other native species that use the creek. To mitigate for this impact, the project includes the placement of high velocity refuge areas (steelhead passage features) within the creek, using large rock and root wads to create areas of calm water for resting and foraging fish. Of these, one is located within the Commission's jurisdiction. Additionally, the project would include the restoration (active and passive re-establishment) of about 1.74 acres of tidal marsh habitats within the creek, within BCDC's jurisdiction, to support fish and other wildlife utilizing the creek and adjacent habitats. The in-stream restoration work would be performed at a 1:1 ratio for temporary project impacts, and a 2:1 ratio for permanent habitat loss/impacts, as agreed upon by CDFW and the Water Board. Additionally, NMFS had originally recommended mitigation for in-stream impacts to Essential Fish Habitat, but the permittee provided NMFS with further information describing how the project as designed will offset temporary impacts to EFH, and NMFS agreed with the permittee's justification.

   To additionally compensate for the impacts of the project on Faber Tract Marsh, the permittee proposed to provide habitat enhancements within the Faber Tract Marsh, with which the USFWS, CDFW and Water Board have agreed. These enhancements include: construction of up to five high tide refugia islands; enhancing approximately 6.0 acres of transition zone and high tide refugia habitat along the levees surrounding the marsh; removal of invasive species along the levees; and planting native mid and high marsh species on the high tide refugia islands and degraded levees. Together, all habitat creation, restoration and enhancement features provide 21.17 acres of enhanced marsh habitat, transition zone, and high tide refuge habitats, of which 9.44 acres would be within the Commission's jurisdiction. These habitat improvements would likely result in increased species survival during marsh inundation as a result of increased vegetative coverage in the refuge areas, which would reduce chances of predation.

In reviewing the Water Board's mitigation requirements, they appear to be consistent with the proposed mitigation package required by other agencies and for the project areas within the Commission's jurisdiction. However, the Water Board included a condition that increases mitigation requirements if the initially required mitigation is not completed within 12 months time of when the associated impact first occurred. If mitigation construction does not occur within a year of the impacts, then the permittee would be responsible for an additional ten percent mitigation per year, as appropriate, on or adjacent to the project site, for the portion of the mitigation not completed within 12 months of the impact occurrence. Further, if on site mitigation is not available, the Water Board has required mitigation at an alternate site at higher ratios than currently proposed.

The project will have both temporary and permanent impacts on 2.19 acres of tidal marsh and high marsh transition habitats within the Commission's jurisdiction as a result of construction activities during the project and will improve a total of 9.44 acres of habitat around the project site, of which 3.44 acres will be tidal marsh and transition habitats. The Commission finds that the project as designed and conditioned herein will minimize impacts to tidal marsh areas, and where impacts are unavoidable, the permittee has proposed habitat improvements that constitute in-kind mitigation at a greater than 1:1 ratio within the Commission's jurisdiction. Additionally, the permittee will construct steelhead passage features along the creek to mitigate for impacts to steelhead trout resulting from increased flows that may occur as a result of the project. Special Conditions II-F-1 through II-F-4 have been included herein to ensure that the habitat improvements occur in a timely manner during construction of the project. The Commission finds that the permittee has proposed sufficient amounts of in-kind and out-of-kind mitigation to mitigate for the temporary and permanent impacts of the project.

2. **Monitoring.** The permittee submitted a draft *Mitigation and Monitoring Plan* (December 2015) and a draft *High Tide Refuge Habitat Enhancement Plan* (H.T. Harvey & Associates 2015), which identify several elements that will be monitored for successful habitat restoration and enhancement. The permittee is proposing annual monitoring of restoration areas over at least a five-year period,

which will be overseen and conducted by a qualified biologist. The permittee is proposing to continue monitoring until defined and agreed upon success criteria are met. The permittee is proposing that target success criteria for the channel be set at 60% restored vegetative cover, which the permittee believes is reasonable given that the project site is in a tidal channel that experiences both erosional and depositional forces.

Monitoring of the marsh berm enhancements and tidal marsh restoration efforts within Faber Tract would proceed once construction is complete and continue over five years, or until the success criteria have been met. The permittee is proposing 60% vegetative cover as target success criteria with no more than 5% invasive species. For the high tide refuge islands, the permittee is proposing success criteria of 70% vegetative cover with no more than 5% invasive species. In the past, the Commission has required 90% vegetative cover as the success criteria for similar projects. The *Monitoring and Management Plan* is currently in a draft form. The Commission staff will continue to work with the permittee to reach agreement on required elements and success criteria of the monitoring program, prior to approval of the plan.

Special Conditions II-D-1 through II-D-7 require the permittee to submit a mitigation and monitoring plan and gain final approval from Commission staff regarding the monitoring of habitat restoration efforts and improvements. This special condition also ensures that discussions between the permittee and Commission staff continue regarding the appropriate success criteria for these habitat improvements and the appropriate monitoring timeline until an agreement is reached. The Commission finds that the project as conditioned herein will provide appropriate monitoring, approved by Commission staff, for the habitat improvements authorized and required herein. The permittee is required by Special Condition II-D-2 herein to submit annual reports on the restoration progress and consult with staff in the event that restoration success criteria are not achieved after the first five years of monitoring.

The Commission finds that the Special Conditions added herein minimize impacts to natural resources within the Commission's jurisdiction, and where impacts to natural resources are unavoidable, the Commission finds that the permittee will provide appropriate mitigation for the impacts. Further, the Commission finds the program for monitoring the restoration and habitat enhancements is generally consistent with the *Bay Plan* monitoring requirements, but is subject to further refinement and approval by Commission staff in the future.

E. **Public Access and Scenic Views.** The McAteer-Petris Act and the Bay Plan policies require that projects provide the maximum feasible public access consistent with the project, that proposed public access be compatible with wildlife, that projects be designed to preserve views to the Bay, and that any public access provided as part of the project remain viable as sea level rises.

1. **Maximum Feasible Public Access.** Section 66602 of the McAteer-Petris Act states that, "...water-oriented land uses along the bay shoreline are essential to the public welfare of the bay area...that existing public access to the shoreline and waters of the San Francisco Bay is inadequate and that maximum feasible public access consistent with a proposed project, should be provided." The Bay Plan Public Access Policy 1 states, "[a] proposed fill project should increase public access to the Bay to the maximum extent feasible...."

   In the project vicinity, the Bay Trail runs along Geng Road from Embarcadero Road to San Francisquito Creek (Exhibit D), continues along the southern bank of the project site to Friendship Bridge, and then north along the levee adjacent to East Palo Alto residences and the Palo Alto Baylands Nature Preserve. There are three existing access points to the Bay Trail located at: (1) Geng Road; (2) the Lucy Evans trail east of the Palo Alto Airport in Palo Alto; and (3) the O'Connor Pump Station via Friendship Bridge in East Palo Alto. Additionally, there are three other informal access points along the levees that are currently used by the public and generally located near (1) Verbena Drive, (2) Daphne Way, and (3) East Bayshore Road on the SFC south levee.

   The permittee will construct and enhance a number of new public access features both within and outside the Commission's jurisdiction, including newly, realigned levees trails, new boardwalk spanning the widened section of the creek, interpretive signage related to Faber Tract Marsh, and two new overlook areas for the public to sit and view San Francisquito Creek and the Bay.

   Within the Commission's jurisdiction, the permittee will realign the SFC south levee and widen the creek. As a result, an approximately one-mile stretch of Bay Trail will be realigned and paved consistent with the existing trail in this area. The new boardwalk constructed in the Commission's jurisdiction would match the design of Friendship Bridge in accordance with the Bay Trail Design Guidelines. The boardwalk will include two viewing platforms, one on each end of the boardwalk, with interpretive signage and also include benches, and other public access amenities.

From May through October in 2016 and 2017, the portion of the Bay Trail portion located along the crown of levee between the golf course and San Francisquito Creek will be temporarily closed. After construction is complete, all recreational facilities will be available for full use by the public.

Because opportunities to increase public access within the project site are limited, the permittee will provide additional public access and recreational opportunities, and improvements outside of BCDC's jurisdiction (Exhibit D). These include: (a) widening sections of trail from 10 feet to 12-16 feet and placing an aggregate base along the trail to improve the trail surface along the SFC north levee, (b) providing an additional trail access point located at East Bayshore Road on the SFC north levee; (c) paving and improving sections of trail along the SFC south levee; and (d) further improving all access points by formalizing trail connections through the use of gate improvements, signage, and other public access amenities. Bollards and gates improvements at the access points would also serve to limit unauthorized recreational motor vehicle access to the trails, and protect pedestrians, bicyclists, and wildlife.

Special Conditions II-G-1 through II-G-7 have been included herein to ensure that the permittee will obtain final approval for all public access plans, construct the public access according to the submitted plans and maintain public access over time. The Commission finds that the public access improvements required herein will improve current public access trails, provide more formal access to the trails around San Francisquito Creek and will provide the maximum feasible public access consistent with the project.

2. **Minimize Impacts to Wildlife.** The Bay Plan Public Access policy 2 states, in part that "...public access to the Bay...should be provided in and through every new development in the Bay or on the shoreline...except in cases where public access would be clearly inconsistent with the project because of public safety considerations or significant use conflicts, including unavoidable, significant adverse effect on Bay natural resources. In these cases, in lieu access at another location preferably near the project should be provided." Additionally, Public Access policy 3 states in part, "...projects in [natural areas with sensitive wildlife] should be carefully evaluated in consultation with appropriate agencies to determine the appropriate location and type of access to be provided." Public Access policy 4 states, in part, that "[p]ublic access should be sited, designed and managed to prevent significant adverse effects on wildlife...."

   Through its BO, the USFWS excluded the use of the levees along the north, south and eastern side of Faber Tract Marsh for public access in order to protect listed species and their habitat. Limiting public access on top of these levees is protective of the state- and federally-listed Ridgway's rail and salt marsh harvest mouse found in and around Faber Tract Marsh. To further protect these and other species and in response to USFWS requirements, the permittee proposes to install a predator exclusion fence along the SFC north levee near the connection point to the Bay Trail and Friendship Bridge (Exhibit B). This fencing is intended to keep out mammalian predators and prevent humans from entering the area. The design of this fence is still in review, and staff will work with the permittee to authorize a fence that both reduces predator access and does not unnecessarily block views to the Bay. Special Condition II-G-3 included herein ensures that the permittee will continue to work with Commission staff to determine appropriate heights and materials that will minimize impacts to wildlife and maximize views of the Bay and Faber Tract Marsh.

3. **Viable Public Access and Maintenance.** Bay Plan policies on public access state that "[p]ublic access should be sited, designed, managed and maintained to avoid significant adverse impacts from sea level rise and shoreline flooding." The project would provide public access along the crown of the levees on either side of the San Francisquito Creek. Bay Plan Public Access policy 6 states, "[w]henever public access to the Bay is provided as a condition of development, on fill or on the shoreline, the access should be permanently guaranteed...any public access provided as a condition of development should either be required to remain viable in the event of future sea level rise or flooding, or equivalent access consistent with the project should be provided nearby."

   The public access proposed by the permittee is located primarily on levee tops, on and adjacent to a bridge crossing the creek, and a boardwalk over newly created marsh (Exhibit D). The flood protection levees and bridge are designed to the 100-year flood level, with a 100-year tide and sea level rise (26 inches) for the life of the project (2060). Beyond 2060, the permittee has stated that earthen levees included in the project have the potential to be raised further by adding earthen baskets or additional floodwalls of synthetic piling and that existing steel sheet pile floodwalls could be raised by welding additional steel sheets to the existing structure. The permittee used the Our Coast Our Future (OCOF) projections (Exhibit M) to illustrate that even with about five feet of sea level rise at 2100, which is the best available data at this time, flooding would likely occur within the Faber Tract Marsh and the golf course to the north and south of the creek, but that the levees are mostly not overtopped based upon the current design. Therefore, the public access would remain viable through the life of the project.

The Commission finds that the public access provided by the project as designed and conditioned herein will provide the maximum feasible public access, protect adjacent wildlife refuge areas and species within those areas, and remain viable over the life of the project.

F. **Bay Plan Priority Use Areas.** Portions of the project are located within two priority use areas designated in the Bay Plan as shown in Bay Plan Map 7: the northern levee adjacent to Faber Tract is designated as a Waterfront Park priority use area and Faber Tract is designate as a Wildlife Refuge priority use area. The Refuge has closed the public access along these levees to protect Ridgway's rail and salt marsh harvest mouse inhabiting Faber Tract Marsh, thereby limiting the use as a Waterfront Park. The project would provide interpretive signage near Friendship Bridge and the new boardwalk to provide information related to Faber Tract Marsh and the wildlife within the area, thus supporting the Waterfront Park use in the adjacent area, while protecting sensitive species and their habitat.

In addition, the Palo Alto Golf Course (golf course) is designated as a waterfront park priority use area. The project would permanently impact a small portion (8.6 acres) of this use by decreasing the size of the golf course to widen the creek, providing additional flow capacity and creating new tidal marsh. Access to the golf course would be temporarily closed during the project and while the City of Palo Alto works on a planned reconfiguration of the golf course. In approximately two years, recreational opportunities at the golf course would be fully restored.

The Wildlife Priority Use area would be impacted during the construction of the high tide refugia, transitional slopes and levee repair. While there will be some disruption to wildlife use, the construction will occur during environmental work windows from June 15th to October 15th. The work on the toe of the levees is limited to a few small areas, and care will be taken to avoid harm to listed species through best management practices. Work within the marsh is expected to be conducted mostly with hand-operated tools, and therefore will limit impacts on wildlife use of the area.

The Commission finds that the project as designed would temporarily affect the Waterfront Park and Wildlife Refuge priority use areas, but after construction is complete, the use would be restored. The exception to this is the limited use of the levee along Faber Tract, but interpretive signage supports the designated Waterfront Park use and the closure of the levee is consistent with wildlife protection. Therefore, the project as authorized and conditioned is consistent with the Waterfront Park and Wildlife Refuge priority use designations of the Bay Plan.

G. **Protection of Shoreline.** Bay Plan policies on Shoreline Protection Policy 1, states, in part, "[n]ew shoreline protection projects and maintenance or reconstruction of existing projects and uses should be authorized if: (a) the project is necessary to provide flood or erosion protection for (i) existing development, use or infrastructure, or (ii) proposed development, use or infrastructure that is consistent with other Bay Plan policies...(c) the project is properly engineered to provide erosion control and flood protection for the expected life of the project based on a 100-year flood event that takes future sea level rise into account... [and] (e) the protection is integrated with current or planned adjacent shoreline protection measures...."

Bay Plan Policy 3 requires that authorized shoreline protection projects be regularly maintained according to a long-term maintenance program and assure protection from tidal erosion and flooding and minimize impacts to natural resources during the life of the project. Shoreline Protection Policy 4 requires that whenever feasible, shoreline protection projects should include nonstructural elements that include elements for Bay ecosystem enhancement and that in shoreline areas that support marsh vegetation, the Commission should require the inclusion of project provisions for establishing marsh and transitional habitats as part of shoreline protection measures. Shoreline Protection Policy 5 requires that impacts to natural resources and public access from new shoreline protection projects be avoided, mitigated or alternative public access should be provided.

In order to improve shoreline protection, the project would construct a steel sheet pile floodwall along approximately 500 linear feet near the O'Connor Way Pump Station and Friendship Bridge to connect the outfall structure at the pump station to the adjacent upstream and downstream levees for shoreline protection. Approximately 200 linear feet of the floodwall would be within the Commission's shoreline band jurisdiction, with portions of the floodwall embedded within the levee on the southern edge of Faber Tract Marsh. The sheet pile floodwall would provide continuous shoreline protection and strengthen the levee against higher volumes and velocities of floodwater that the project would accommodate.

To restore flood protection along the creek, low spots on the unmaintained levee north of San Francisquito Creek would be repaired with engineered soils to strengthen the levee and accommodate anticipated future high flow events. The final height of the levee would be a maximum of 13 feet (NAVD88). In reinforcing the levee, the toe of the levee within Faber Tract would be widened and a new slope at six horizontal to one vertical foot would be created to protect against levee erosion due to flow overtopping, and reduce potential impacts to the adjacent marsh. The widening of the toe of the levee will stabilize it without the need for placing riprap within the marsh.

In accordance with Policy 4, the permittee anticipates that tidal marsh vegetation and transition zone habitats would migrate up the levee slopes adjusting to the changing hydrology and would remain present with two feet of predicted sea level rise. However, there is potential for substantial loss of tidal marsh habitat within the project area with predicted sea level rise of about five feet, but these impacts would be beyond the current planned life of the project. Regarding Shoreline Protection Policy 5, the project would have potential impacts to habitat and wildlife, which it is addressing through mitigation measures discussed under the mitigation section above.

The project includes the placement of minor amounts of fill for shoreline protection and the use of habitat features to support and restore marsh vegetation within the creek. Special Conditions II-H herein requires that all riprap installed during the project will be appropriately designed and maintained over the life of the project. Additionally, Special Conditions II-B and II-C require construction best management practices to minimize impacts to adjacent marsh and aquatic environments during project construction. Impacts associated with the placement of riprap, construction of floodwalls and levees will be mitigated through habitat restoration in San Francisquito Creek and Faber Marsh and as required in Special Condition II-F.

Special Conditions have been added herein to ensure that the shoreline improvements are built to appropriate engineering safety standards and undergo plan review and that the shoreline protection features (levees, floodwalls, riprap, etc.) are appropriately maintained over the life of the project. The project has also been designed to account for reasonable foreseeable flooding and stormwater hazards over the life of the project.

With the Special Conditions included above, the Commission finds that the project design will be constructed in accordance with sound safety standards, offer protection to persons and property against flooding or stormwater hazards over the life of the project, will minimize impacts to natural resources, and that the authorized fill will establish a permanent shoreline to protect residents in areas adjacent to the creek.

H. **Review Boards**

1. **Engineering Criteria Review Board.** The Engineering Criteria Review Board did not evaluate the proposed project.

2. **Design Review Board.** Given the nature of the proposed improvements, the Design Review Board did not evaluate the proposed project.

I. **Environmental Review.** In accordance with the California Environmental Quality Act (CEQA) requirements, the JPA certified the Final Environmental Impact Report (FEIR) for the project on October 25, 2012 (JPA Resolution Number 12-10-25A). The FEIR found that the project would have significant impacts to some special status species and their habitat areas, air quality, and recreation, of which most impacts could be reduced to a less-than-significant level through minimization and mitigation measures. However, the CEQA review found that the project would likely result in significant and unavoidable effects on air quality associated with construction of various project elements during all project phases. Additionally, the project would have significant and unavoidable effects on recreation due to a reduction in the size of the existing golf course (loss of 7.4 acres of golf course) as a result of the levee realignment and creek widening. The JPA has committed to all feasible mitigation to reduce impacts on air quality, but the residual effect is still likely to be significant. The proposed mitigation measure for recreation impacts is outside the JPA's jurisdiction and therefore cannot be guaranteed. No additional feasible mitigation for recreational impacts is available.

   The JPA adopted a Statement of Overriding Considerations, which acknowledged the existing flood risks along San Francisquito Creek associated with lack of adequate capacity in the creek, and considered the analysis of all the project outcomes. The JPA found that the economic, social, and environmental benefits of meeting the project's flood protection goals outweigh the significant and unavoidable air quality and recreation impacts associated with the project's construction and operation. The Water Board agreed on April 7, 2015 that the FEIR appropriately addressed the foreseeable potential environmental impacts from the project.

J. **Conclusion**. For all the above reasons, the Commission finds, declares, and certifies that, subject to the Special Conditions stated herein, the project authorized herein is consistent with the McAteer-Petris Act, the *San Francisco Bay Plan,* the Commission's Regulations, the California Environmental Quality Act, and the Commission's Amended Management Program for the San Francisco Bay segment of the California coastal zone.

IV. Standard Conditions

A. **Permit Execution**. This permit shall not take effect unless the permittee(s) execute the original of this permit and return it to the Commission within ten days after the date of the issuance of the permit. No work shall be done until the acknowledgment is duly executed and returned to the Commission.

B. **Notice of Completion**. The attached Notice of Completion and Declaration of Compliance form shall be returned to the Commission within 30 days following completion of the work.

C. **Permit Assignment**. The rights, duties, and obligations contained in this permit are assignable. When the permittee(s) transfer any interest in any property either on which the activity is authorized to occur or which is necessary to achieve full compliance of one or more conditions to this permit, the permittee(s)/transferors and the transferees shall execute and submit to the Commission a permit assignment form acceptable to the Executive Director. An assignment shall not be effective until the assignees execute and the Executive Director receives an acknowledgment that the assignees have read and understand the permit and agree to be bound by the terms and conditions of the permit, and the assignees are accepted by the Executive Director as being reasonably capable of complying with the terms and conditions of the permit.

D. **Permit Runs With the Land**. Unless otherwise provided in this permit, the terms and conditions of this permit shall bind all future owners and future possessors of any legal interest in the land and shall run with the land.

E. **Other Government Approvals**. All required permissions from governmental bodies must be obtained before the commencement of work; these bodies include, but are not limited to, the U. S. Army Corps of Engineers, the State Lands Commission, the Regional Water Quality Control Board, and the city or county in which the work is to be performed, whenever any of these may be required. This permit does not relieve the permittee(s) of any obligations imposed by State or Federal law, either statutory or otherwise.

F. **Built Project must be Consistent with Application**. Work must be performed in the precise manner and at the precise locations indicated in your application, as such may have been modified by the terms of the permit and any plans approved in writing by or on behalf of the Commission.

G. **Life of Authorization**. Unless otherwise provided in this permit, all the terms and conditions of this permit shall remain effective for so long as the permit remains in effect or for so long as any use or construction authorized by this permit exists, whichever is longer.

H. **Commission Jurisdiction**. Any area subject to the jurisdiction of the San Francisco Bay Conservation and Development Commission under either the McAteer-Petris Act or the Suisun Marsh Preservation Act at the time the permit is granted or thereafter shall remain subject to that jurisdiction notwithstanding the placement of any fill or the implementation of any substantial change in use authorized by this permit. Any area not subject to the jurisdiction of the San Francisco Bay Conservation and Development Commission that becomes, as a result of any work or project authorized in this permit, subject to tidal action shall become subject to the Commission's "bay" jurisdiction.

I. **Changes to the Commission's Jurisdiction as a Result of Natural Processes**. This permit reflects the location of the shoreline of San Francisco Bay when the permit was issued. Over time, erosion, avulsion, accretion, subsidence, relative sea level change, and other factors may change the location of the shoreline, which may, in turn, change the extent of the Commission's regulatory jurisdiction. Therefore, the issuance of this permit does not guarantee that the Commission's jurisdiction will not change in the future.

J. **Violation of Permit May Lead to Permit Revocation**. Except as otherwise noted, violation of any of the terms of this permit shall be grounds for revocation. The Commission may revoke any permit for such violation after a public hearing held on reasonable notice to the permittee(s) or their assignees if the permit has been effectively assigned. If the permit is revoked, the Commission may determine, if it deems appropriate, that all or part of any fill or structure placed pursuant to this permit shall be removed by the permittee(s) or their assignees if the permit has been assigned.

K. **Should Permit Conditions Be Found to be Illegal or Unenforceable.** Unless the Commission directs otherwise, this permit shall become null and void if any term, standard condition, or special condition of this permit shall be found illegal or unenforceable through the application of statute, administrative ruling, or court determination. If this permit becomes null and void, any fill or structures placed in reliance on this permit shall be subject to removal by the permittee(s) or their assignees if the permit has been assigned to the extent that the Commission determines that such removal is appropriate. Any uses authorized shall be terminated to the extent that the Commission determines that such uses should be terminated.

L. **Permission to Conduct Site Visit**. The permittee(s) shall grant permission to any member of the Commission's staff to conduct a site visit at the subject property during and after construction to verify that the project is being and has been constructed in compliance with the authorization and conditions contained herein. Site visits may occur during business hours without prior notice and after business hours with 24-hour notice.

M. **Abandonment**. If, at any time, the Commission determines that the improvements in the Bay authorized herein have been abandoned for a period of two years or more, or have deteriorated to the point that public health, safety or welfare is adversely affected, the Commission may require that the improvements be removed by the permittee(s), its assignees or successors in interest, or by the owner of the improvements, within 60 days or such other reasonable time as the Commission may direct.

N. **In-Kind Repairs and Maintenance.** Any in-kind repair and maintenance work authorized herein shall not result in an enlargement of the authorized structural footprint and shall only involve construction materials approved for use in San Francisco Bay. Work shall occur during periods designated to avoid impacts to fish and wildlife. The permittee(s) shall contact Commission staff to confirm current restricted periods for construction.

Executed at San Francisco, California, on behalf of the San Francisco Bay Conservation and Development Commission on the date first above written.

LAWRENCE J. GOLDZBAND
Executive Director
San Francisco Bay Conservation and
Development Commission

By: ______________________
BRAD McCREA
Regulatory Program Director

* *

Receipt acknowledged, contents understood and agreed to:

Executed at 455 Golden Gate Ave San Francisco, CA 94102

San Francisquito Creek Joint Powers Authority
Permittee

On February 23, 2016

By: ______________________

Len Materman, Executive Director
Print Name and Title

cc: California Department of Fish and Wildlife, Craig Weightman
NOAA National Marine Fisheries Service, Amanda Morrison
US Fish and Wildlife Service, Joseph Terry
San Francisco Regional Water Quality Control Board, Susan Glendening
US Army Corps of Engineers, Gregory Brown
San Francisco Bay National Wildlife Refuge Complex, Anne Morkill
City of Palo Alto
City of Menlo Park
City of East Palo Alto
San Mateo County Flood Control District
Santa Clara Valley Water District

PERMIT NO. 2013.007.00

SAN FRANCISQUITO CREEK JOINT POWERS AUTHORITY

CERTIFICATION OF CONTRACTOR REVIEW

San Francisco Bay Conservation
and Development Commission
455 Golden Gate Avenue, Suite 10600
San Francisco, CA 94102

Ladies and Gentlemen:

You are hereby informed that prior to commencing any grading, demolition, or construction authorized by the above referenced permit, I personally reviewed and understand the terms and conditions of the permit, the final plans approved by or on behalf of the Commission, particularly as they pertain to the public access, and environmentally sensitive areas required herein, for those portions of the work for which I am in charge.

I, __________, hereby declare under penalty of perjury that the foregoing is true and correct and that if called upon to testify to the contents of this notice, I would so testify.

Executed on this ______________________ day of __________________________,

20_____, at____, California.

____
Contractor Name and Company

____
(Title)

PERMIT NO. 2013.007.00

SAN FRANCISQUITO CREEK JOINT
POWERS AUTHORITY

NOTICE OF COMPLETION AND DECLARATION OF COMPLIANCE

San Francisco Bay Conservation
and Development Commission
455 Golden Gate Avenue, Suite 10600
San Francisco, CA 94102

Ladies and Gentlemen:

You are hereby informed that the work authorized by the above-referenced permit was completed on __________.

I have personally reviewed the terms and conditions of the permit, the final plans approved by or on behalf of the Commission, and the completed project and hereby certify that the project is in compliance with all terms and conditions of the permit and conforms to the plans previously reviewed and approved by or on behalf of the Commission. I further certify that all conditions of the permit, particularly with regard to plan review, public access areas and improvements, and other special conditions have been met.

I, __________, hereby declare under penalty of perjury that the foregoing is true and correct and that if called upon to testify to the contents of this notice, I would so testify.

Executed on this ____________________ day of ________________________,

20_____, at ____, California.

____
(Permittee)

____
(Title)

SAN FRANCISQUITO CREEK HYDROLOGY STUDY

Hydraulics, Hydrology and Geomorphology Unit

DRAFT FINAL

Prepared by:

Jack Xu, PE
Associate Civil Engineer

Under the Direction of:

Liang Xu, Ph.D, PE
Engineering Unit Manager

JULY 2015

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- SFC Flood Frequency Analysis PeakFQSA Output
- Balance Hydrologics Recorded Data Spreadsheet
- Hydrologic Parameters Spreadsheet
- Channel Routing Spreadsheet
- Design Rainfall Spreadsheet
- 2D Model Output Spreadsheet

1. INTRODUCTION

1.1. BACKGROUND

San Francisquito Creek forms the boundary of the Santa Clara Valley Water District's (SCVWD) jurisdiction to the north with San Mateo County. The watershed is approximately 45 square miles, with the majority of the watershed in the rural foothills of the San Francisco Peninsula. The Creek's watershed impacts the cities of Palo Alto, East Palo Alto, and Menlo Park. Stanford University is also a major landowner in the region and owns several reservoirs within the watershed.

San Francisquito has three main tributaries that combine to form the creek proper once it leaves the foothills and enters the urbanized valley. Bear Creek is the northernmost tributary and is unimpaired. To the south, Searsville Lake and Dam collect runoff from Alambique, Dennis Martin, Sausal, and Corte Madera Creeks. Searsville Lake offers some attenuation, but has experienced severe sedimentation over time. On the southeastern edge of the watershed, Los Trancos Creek flows unimpaired, passing Felt Lake, a diversion pond owned by Stanford. All three of these tributaries meet before traveling downstream toward the bay through urbanized neighborhoods.

A location map with information about the creek watershed and sub-watersheds is on Figure 1.

1.2. PURPOSE

The purpose of this report is to update the 2007 San Francisquito Hydrology Report[1] by improving the following items from the old report:

1. Upgrading the numerical model from HEC-1 to HEC-HMS v4.0.
2. Characterizing the routing effects of Searsville Lake and dam by using a 2D hydraulic model.
3. Using revised and improved methodology for design storms, loss, and Clark's hydrograph parameters (Tc & R).
4. Calibrating the numerical model to historical storms.
5. Performing a flood frequency analysis (FFA) on the USGS stream gage and validating the hydrologic design model to the FFA.

To do this, a new hydrologic model that reflects the existing San Francisquito Creek watershed was developed. This model will be used to determine revised 1% and 10% design flows for the entire creek.

[1] Wang, James et al. SCVWD. San Francisquito Creek Hydrology Report. April 2006, Revised December 2007.

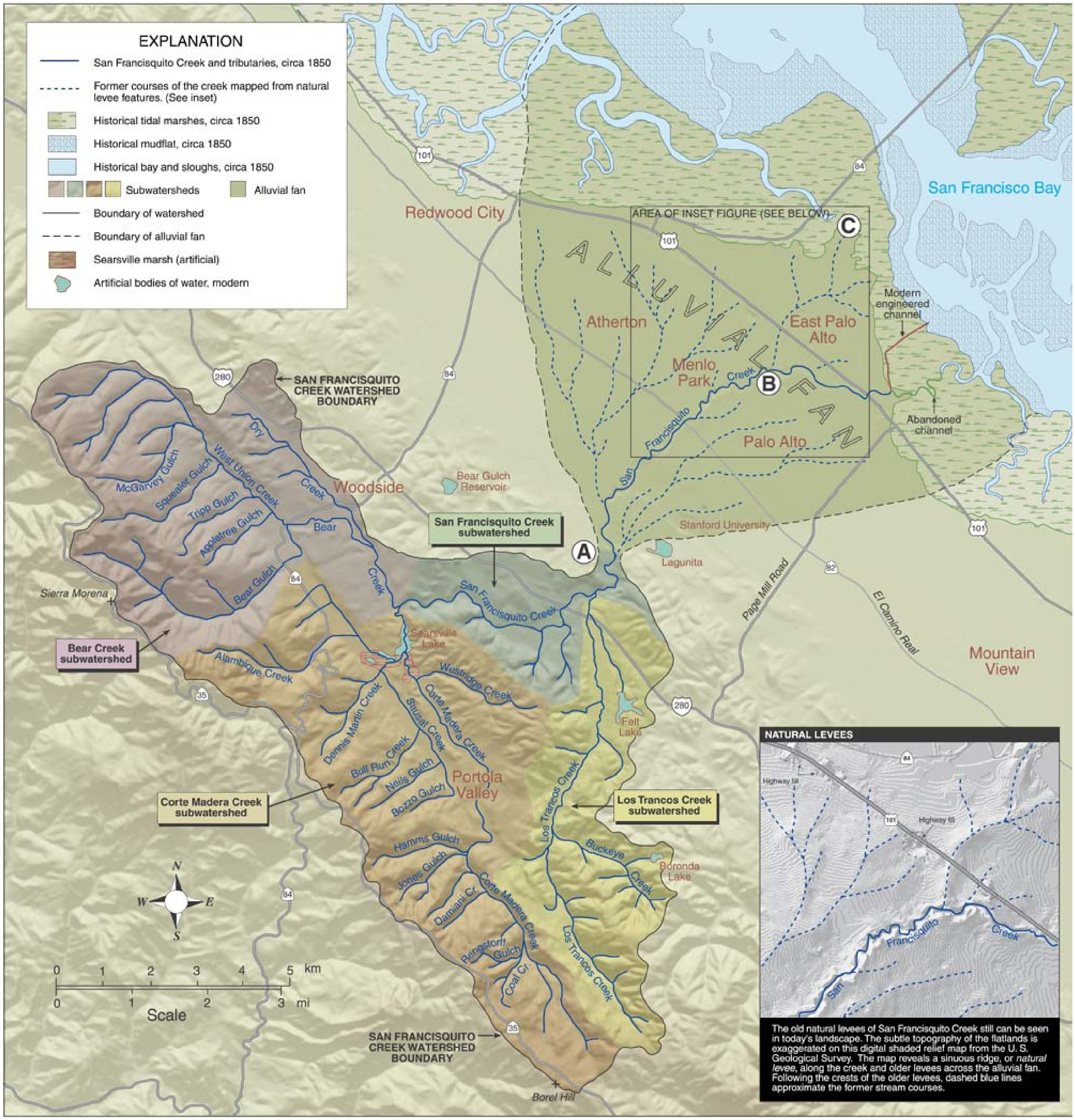

Figure 1: San Francisquito Creek Watershed Map

2. MODEL INPUT PARAMETERS

2.1. WATERSHED DELINEATION

Sub-basin watershed delineation was performed by using the ArcHydro add-on to the original ArcGIS software suite. A digital elevation model (DEM) was created from two sources. For Santa Clara County, the 2006 LiDAR data was used, while for San Mateo County, USGS data was used. These elevation datasets were used to determine flow accumulation patterns and ultimately sub-basin delineations. Each sub-basin within an urban area was double checked manually to ensure that terrain features not picked up by the DEM were included, such as walls and levees. In addition, delineations were manually created at stream gage locations and dams.

Two delineated sub-basins were determined not to contribute to San Francisquito Creek flow. The first is the area tributary to Felt Lake. The second is the Stanford golf course.

2.2. SURFACE RUNOFF METHOD

The Army Corp's HEC-HMS hydrologic modeling software was used to perform this study. The Soil Conservation Service (SCS) Curve Number (CN) method was selected as the loss method, and Clark's Unit Hydrograph (CUH) was selected as the transform method. Since the model will primarily be used to determine design flow rates, it will be used as an event-based model, which is appropriate for the SCS loss method. The CUH method is robust for watersheds of different sizes and shapes. Based on previous experiences, the SCS method combined with CUH transform method works well within the Santa Clara Valley Watershed.

2.3. SUB-BASIN PARAMETERS

Six different variables; (2.3.1) Area, (2.3.2) Initial Abstraction, (2.3.3) Curve Number (CN), (2.3.4) Impervious Area, (2.3.5) Time of Concentration, and (2.3.6) Reach Coefficients must be characterized for each sub-basin and are listed below in further detail.

2.3.1. AREA

This is defined as the total area of the sub-basin in square miles. It is determined from area measurements performed in ArcGIS.

2.3.2. INITIAL ABSTRACTION

Initial abstraction represents the initial loss on each sub-basin, and also has bearing on the runoff equation used in HEC-HMS for CN method. The default relationship outlined in the SCS CN loss method is that initial abstraction is 20% of sub-basin storage. However, recent research[2],[3] suggests that 5% is a more appropriate value. Storm calibrations within this model

[2] Kyoung Jae Lim, et al. Effects of Initial Abstraction and Urbanization on Estimated Runoff Using CN Technology. June 2006. Journal of the American Water Resources Association.

[3] Hawkins, Richard H. Woodward, Donald E. Runoff Curve Number Method: Examination of the Initial Abstraction ratio. 2002.

have also supported the 5% value suggested by Hawkins and Lim et al. The initial abstraction used for rural sub-basins is defined by:

$$Initial\ Abstraction = 0.05\ \times \left(\frac{1000}{CN} - 10\right)$$

While changing the initial abstraction for the SCS CN method, proper procedure dictates that the CN be modified as well, since HEC-HMS adjusts rainfall excess based on initial abstraction, and initial abstraction is related to the sub-basin storage index (S) that was fixed using a 20% ratio during the development of the SCS method. Since S is directly related to CN, the CN number would need to be adjusted as well if the ratio was changed to 5%. However, calibrations suggested that overall volume was matching observations without adjusting CN.

2.3.3. CURVE NUMBER (CN)

Curve number represents the pervious sub-basin characteristic for surface runoff. Internal parameters of curve number are; soil group, land cover type, and antecedent moisture condition (AMC). Curve number development was performed in accordance with a District memorandum[4] on SCS CN determination.

2.3.4. IMPERVIOUS AREA

Impervious area characterizes the amount of area, in percent, within the sub-basin that will experience negligible loss. These areas are generally considered paved urban areas. This value is based on the 2006 National Land Cover Dataset (NLCD) and is aggregated for each sub-basin in ArcGIS.

For watersheds with large amounts of urban areas, an impervious area reduction is commonly used to account for unconnected impervious areas. However, due to the majority rural makeup of the San Francisquito watershed, a reduction was not used.

2.3.5. TIME OF CONCENTRATION (Tc)

Time of concentration is the maximum travel time for each sub-basin. The velocity method described in NEH Chapter 15[5] was used to determine time of concentration. General guidelines used by the District are outlined in a technical memorandum[6] on this subject.

In general, possible collectors and collector combinations were categorized into similar slopes and cross sections. A reiterative process was used to solve manning's equation for velocity, given a certain flow depth. The flow depth was determined from a given flow rate that was selected based on USGS regression equations. The equations serve as a broad estimation of the flow for different recurrence events given the sub-basins characteristics. Therefore, several times of concentrations for each sub-basin were developed, depending on the flow.

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[4] Xu, Jack. SCVWD Technical Memorandum. SCS Curve Number Determination, Update #1. January 10th, 2015.

[5] USDA NRCS. Part 630 Hydrology, National Engineering Handbook. Chapter 15, Time of Concentration.

[6] Xu, Jack. SCVWD Technical Memorandum. Time of Concentration (Tc). November 10, 2014.

2.3.6. STORAGE COEFFCIENT (R)

The storage coefficient represents the amount of storage and attenuation that will not be lost within the sub-basin for the CUH method. This variable will change the shape of the runoff hydrograph. Studies[7] have shown that the storage coefficient ratio remains constant over a large watershed area:

$$Ratio = \frac{R}{R + Tc}$$

A ratio above 0.5 implies more storage and a wider hydrograph with a smaller peak flow. A ratio below 0.5 implies a narrow response with a larger peak flow. This value is held constant for each general topographic area within the Coyote Watershed for all calibration events. For the entire San Francisquito Creek watershed, calibrations supported a storage coefficient ratio of 0.5.

2.4. REACH ROUTING PARAMETERS

All reach routing was performed from sub-basin to sub-basin using the Muskingum-Cunge method in the hydrologic model, except for Searsville Reservoir. Slopes were taken using elevations at 10% and 85% of the reach length. Manning's roughness coefficients and channel geometry were estimated using aerial images and field visits. For creek reaches downstream of the Los Trancos Creek confluence, a HEC-RAS existing conditions model is available[8]. Channel geometries and slopes were taken from this model and input into the hydrologic model. These geometric parameters did not change during calibration and are summarized in Table 1.

The following assumptions were made to fit the scope of this report in determining design flows:

- All stream channels contain all the flows. There are no breakouts or spills.
- There are no flows entering or leaving the watershed boundaries from spills.

[7] USACOE HEC-HMS Users Manual v3.5. August 2010. Chapter 7, pg.141.

[8] Noble Consultants. Final Report – San Francisquito Creek Hydraulic Modeling and Floodplain Mapping, Existing Condition. Volume I: Channel Hydraulic Modeling. August 2, 2010. Prepared for USACE SF District.

Table 1: Reach Routing Parameters

Reach ID	Length (ft)	Channel n-value	Slope (ft/ft)	Slope/n Determination
SFQ_A1_ChnRT	9596	0.05	0.002111	GIS & Field Visit
SFQ_AA14_Z_ChnRT	5293	0.05	0.003862	GIS & Field Visit
SFQ_E_z_ChnRT	18751	0.043	0.00544	RAS
SFQ_G1_ChnRT	7200	0.05	0.021	GIS & Field Visit
SFQ_G2_Z_ChnRT	11000	0.05	0.0137	GIS & Field Visit
SFQ_G5_Z_ChnRT	2049	0.05	0.007112	GIS & Field Visit
SFQ_G6_Z_ChnRT	6264	0.043	0.00694	RAS
SFQ_H_Z_ChnRT	7062	0.043	0.00565	RAS
SFQ_J2_Z_ChnRT	4971	0.043	0.00322	RAS
SFQ_L_Z_ChnRT	10142	0.043	0.00252	RAS
SFQ_M_Z_ChnRT	9361	0.043	0.00201	RAS
SFQ_N_Z_ChnRT	7761	0.03	0.00045	RAS
SFQ_B1_ChnRT	17495	0.05	0.005323	GIS & Field Visit
SFQ_D_ChnRT	6588	0.06	0.002921	GIS & Field Visit
Reaches only in "No Searsville Lake" Model				
SFQ_BB11_ChnRT	7172	0.05	0.003923	GIS & Field Visit
SFQ_BB13_ChnRT	6616	0.05	0.006561	GIS & Field Visit
SFQ_C6_ChnRT	6197	0.05	0.003009	GIS & Field Visit

2.5. DETENTION FACILITIES

In the San Francisquito Creek watershed, there are three notable detention facilities; Felt Lake, Lake Lagunita, and Searsville Lake.

Felt Lake is used as a water supply source for Stanford University, and generally does not impact the overall flow of the watershed. This is also true for Lake Lagunita, which detains runoff from the campus golf course. Conversations with Stanford facilities revealed that Felt Lake and Lake Lagunita have never overtopped, even during the storm of record in 1998. In addition, a sensitivity study performed by peer review showed very little impact. Therefore, both lakes and the contributing runoff area were taken out of the model.

Searsville Lake impounds almost 15 square miles of the watershed behind it. Due to ongoing sedimentation, the lake only has about four feet of storage before spilling, if empty. However, the backwater effect caused by the dam, the wetland behind it, and surrounding low-lying areas, has caused significant attenuation in the past. Observations from historical events suggest that typical volume/discharge methods would not be sufficient. To route the flow from the upland tributaries, through the lake, and out the dam, a 2D hydraulic model was used.

2.6. SEARSVILLE LAKE 2-D HYDRAULIC MODEL

HEC-RAS Version 5.0 BETA, October 2014 release, was used to properly model Searsville Lake. A 2D computation mesh was created by using a *.LAS dataset from the 2006 LiDAR survey that generated a digital terrain model with 10' x 10' squares. This dataset was cleaned to remove errant reflectivity data from foliage and buildings by the survey vendor. Relevant hydraulic structures were inputted with data from Balance Hydrology's 1D HEC-RAS model[9] of Searsville that was sent to the District for review in 2014. The outfall of the entire model was modeled as a 2D Boundary Condition Line, whose conditions were determined using a rating curve generated from Balance Hydrology's model. This curve was double checked with recorded stage and flow data from historical events, which was also provided by Balance.

The 2D Boundary Condition Line spans six grid elements, and during simulation, five of those grid elements are wetted. Due to program limitations in the beta, water surface elevations can only be determined on a grid-by-grid basis while in the 2D domain. Conversation with Gary Brunner, lead developer at HEC, revealed that the computational scheme allows for different water surface elevations within each grid at the boundary condition line. Each grid independently uses the rating curve based on its connection at the boundary condition line. Therefore, there are slight variations in the water surface elevations, depending on grid characteristics. To force a singular output for the water surface, the 2D domain would need to be connected to a 1D cross section within the reservoir. Since bathymetry is not available, the five wetted grids will be averaged to determine a single water surface elevation, which will be used to determine flow from the rating curve.

Computational point spacing for the mesh was set at 100' x 100' and 50' x 50', depending on the detail required. A sensitivity analysis that ran the same model at a 10' x 10' mesh showed negligible output difference. The diffusive wave computational method was selected over the full dynamic solution due to the lack of potential energy losses through obstructions. A sensitivity analysis using different methods also yielded negligible difference.

To properly characterize the lake, several historical calibrations needed to be run to determine if the model is accurate. When available, stream gage data was used as input into the model. HEC-RAS inputs from other tributaries that were not gaged were estimated. Using the following storm events, a final manning's roughness coefficient of 0.1 worked well for all the storms.

- December 2012 (Figure 2)
- March 2011 (Figure 3)
- January 2010 (Figure 4)
- December 2005 (Figure 5)
- February 1998 (Figure 6)

To estimate the HEC-RAS inflow inputs from the Searsville Lake tributaries, several methods were employed. For the 2011 and 2010 events, only one tributary (Corte Madera Creek) was gaged. For 1998, there were no gages upstream of the dam. These events also had reliable gage adjusted radar rainfall data, and were used in the historical calibrations for the hydrologic

[9] Sears_US_JPA_052114.prj. Balance Hydrology is Stanford University's consultant.

model. Therefore, outputs from the HEC-HMS hydrology model were used as tributary inflow inputs for the HEC-RAS models. Parameters used in the HMS model were the same as in the model calibrations for the specific event.

For the 2005 event, only Corte Madera Gage was gaged. However, rainfall data was not reliable. Therefore, the remainders of the tributary inflows were determined by scaling the Corte Madera Creek hydrograph based on drainage area.

The 2012 event had two gaged tributaries. Additionally, a third tributary had visual observations for estimated flow. For the remaining tributaries, flow was determined by scaling the hydrographs from the average of the two gaged tributaries, much like in the 2005 event. However, for the tributary with visual observations, the hydrograph was modified so that the observed flow values properly fit within the rising and receding values of the hydrograph.

Using the calibrated 2D hydraulic model and recorded data, a separate technical memorandum[10] was published. This report attempted to quantify the causes of attenuation for Searsville Lake and the effects of the Lake on San Francisquito Creek during significant storm events.

[10] Xu, Jack. SCVWD. Technical Memorandum - Effect of Searsville Lake on Large Storm Events. March 25, 2015.

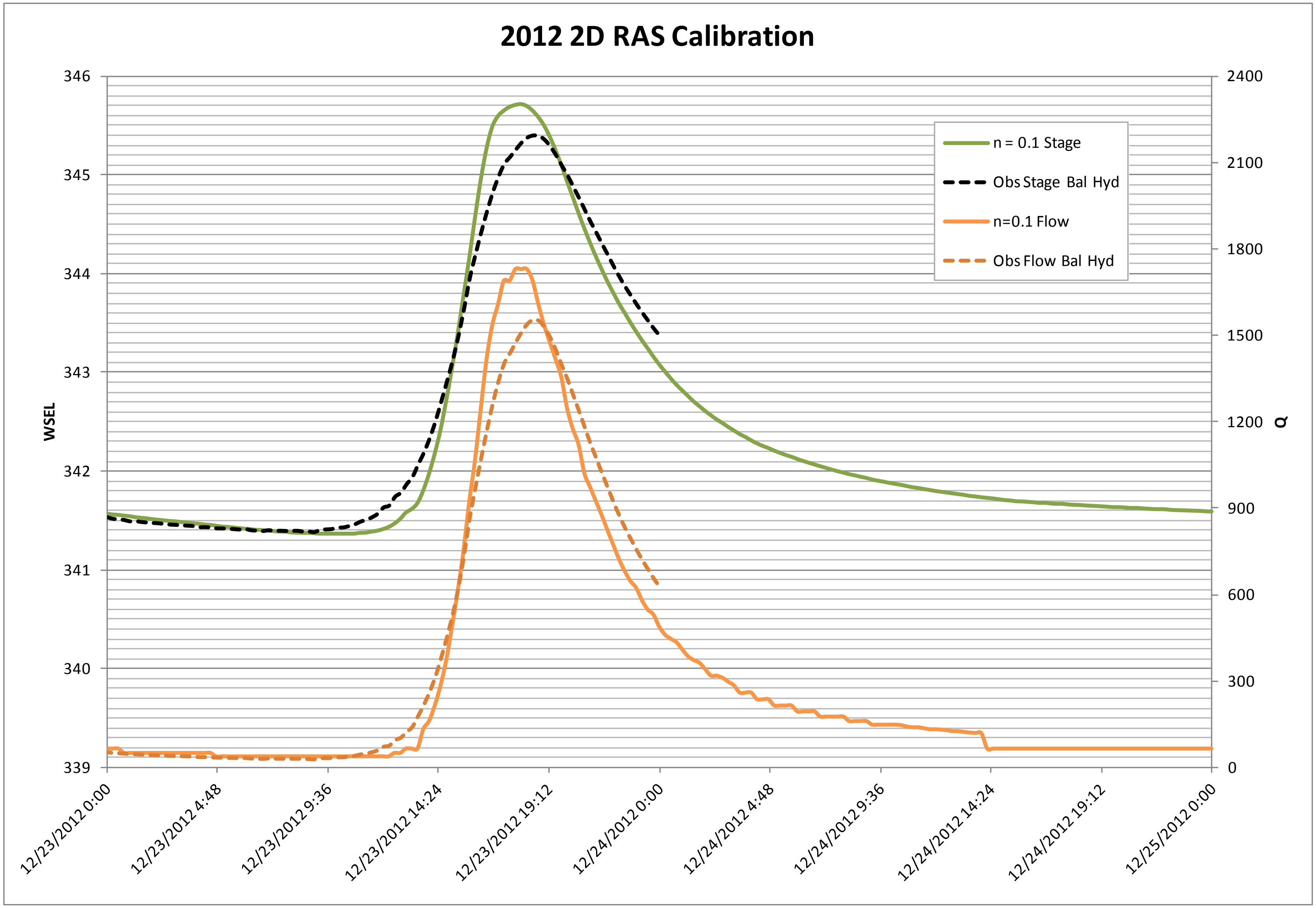


Figure 2: 2012 Searsville 2D Model Calibration

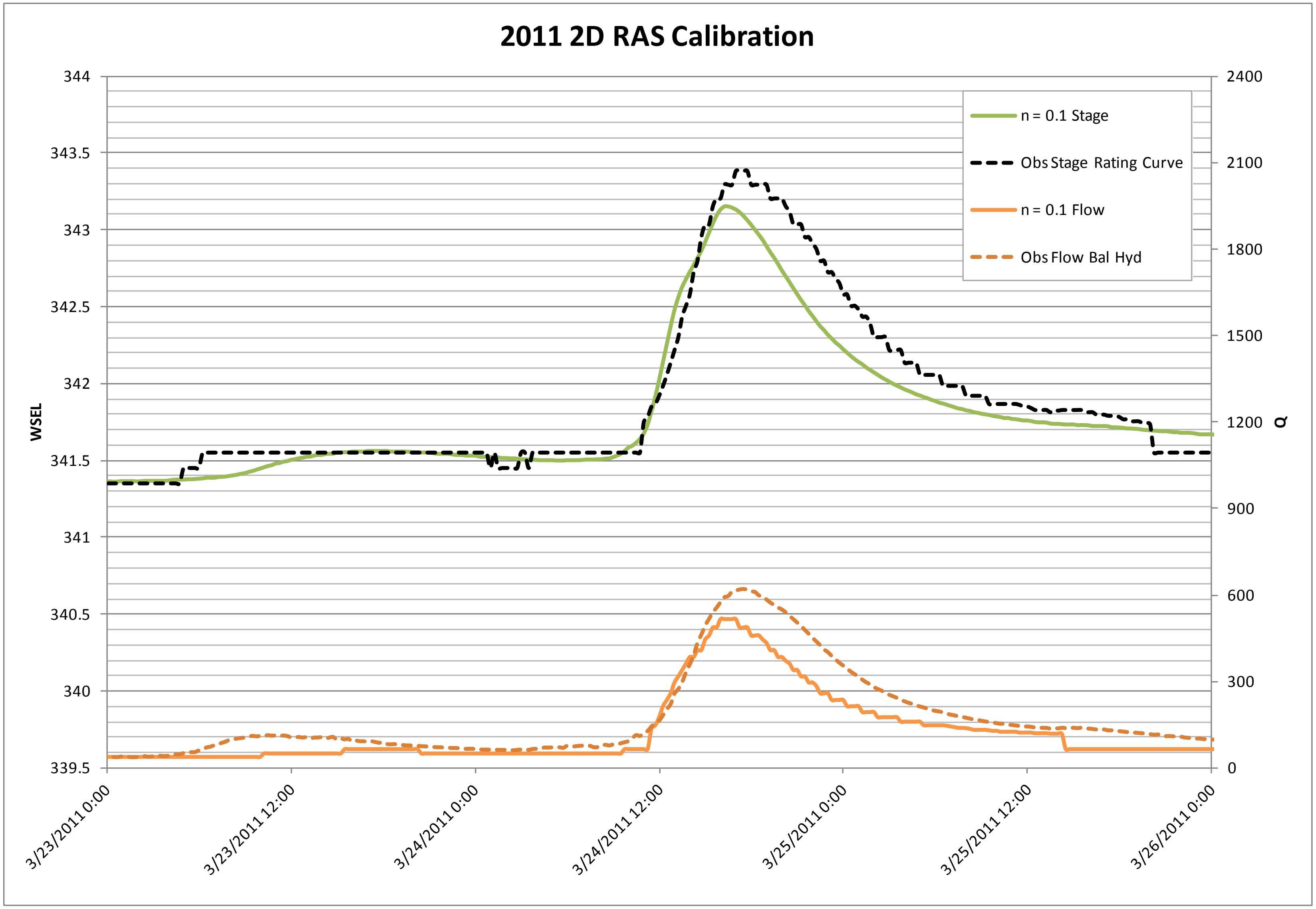


Figure 3: 2011 Searsville 2D Model Calibration

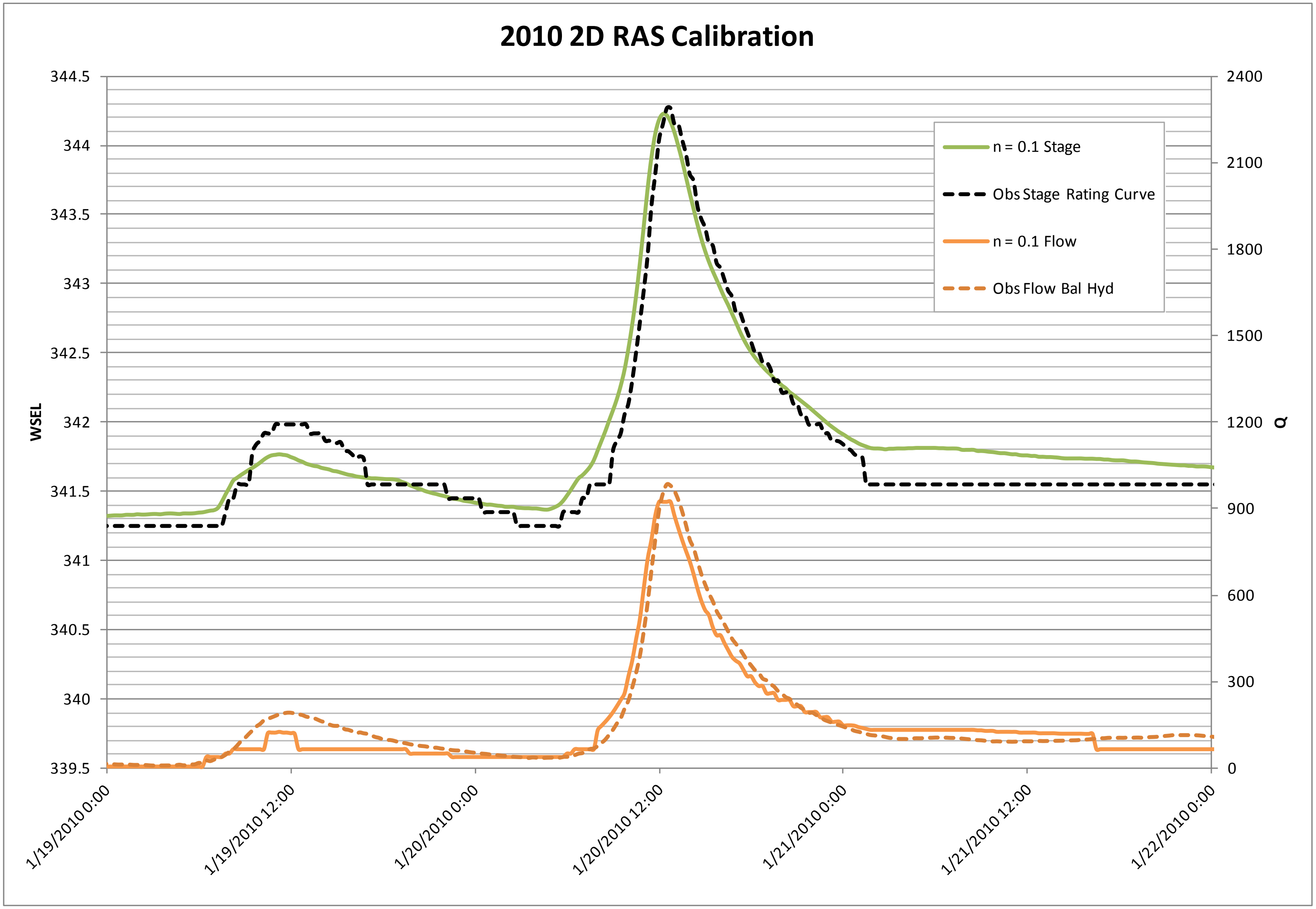


Figure 4: 2010 Searsville 2D Model Calibration

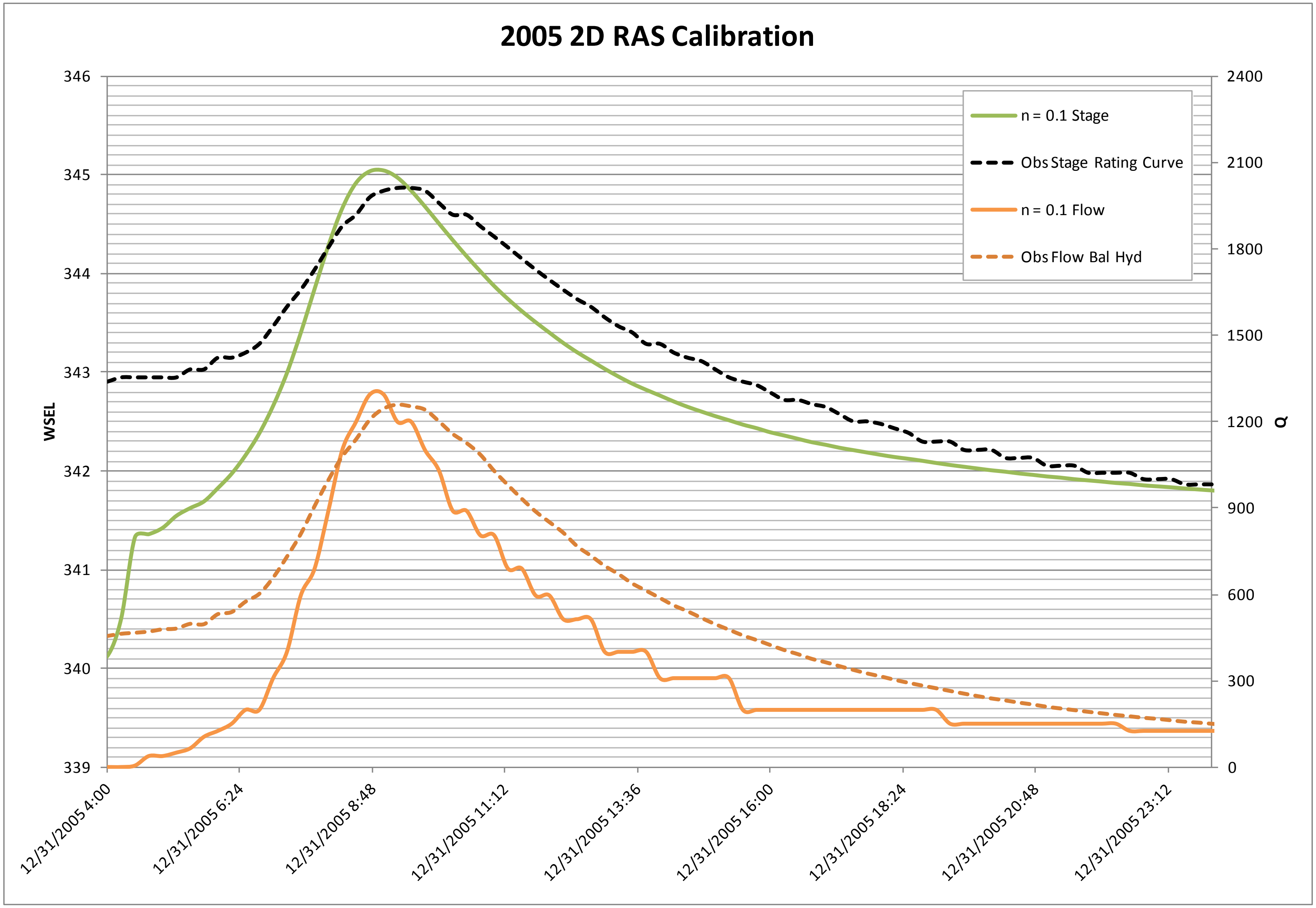


Figure 5: 2005 Searsville 2D Model Calibration

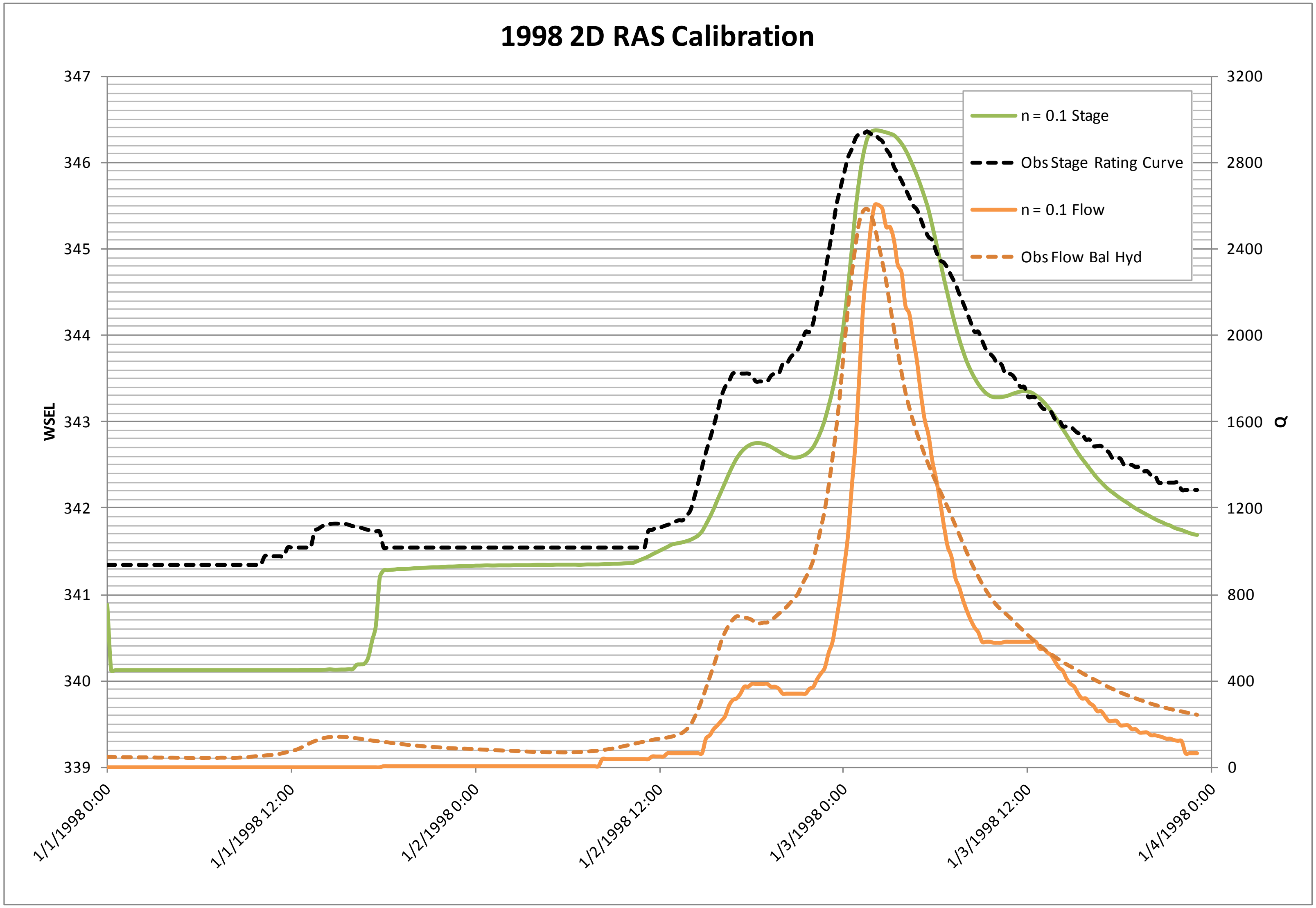


Figure 6: 1998 Searsville 2D Model Calibration

3. MODEL CALIBRATION AND VERIFICATION

3.1. STREAM GAGES

Several stream gages operated by Balance Hydrology (Stanford) have been installed recently on the upstream tributaries of San Francisquito Creek, but data availability for storm events is spotty. There is also a USGS gage, #11164500, near Stanford that has 74 annual maximum observations over 83 years. This gage will be used to determine the flood frequency analysis (FFA).

3.2. CALIBRATION PROCEDURE

The San Francisquito Creek HEC-HMS hydrology model was calibrated and verified to observed stream gage data by using historical gage adjusted rainfall radar data that has been calibrated to observed rain gage data. In short, observed rainfall data was used as input into the hydrologic model for several historic storm events, and the output values compared to observed stream gage data for the same event.

Calibration and verification was done by using the USGS gage recorded flows as the primary gage, since it is considered the most reliable. Gages operated by Balance upstream of the USGS gage were considered suspect for some events. The observed data from these gages were used when evidence did not prove them suspect. However, the observed data was still used as a general reference for suspect events to determine peak timing. Five sub-areas were categorized based on gage catch points to facilitate discussion of model calibration results. The general flowchart is shown in Figure 7.

- Searsville, which includes the area tributary to Searsville Lake and Dam.
- Bear, which includes all of Bear Creek and tributaries up to its confluence to San Francisquito Creek below the Dam.
- Los Trancos, which includes all of Los Trancos Creek and tributaries up to the stream flow gage.
- USGS, which includes all the drainage area from Searsville, Bear, and Los Trancos, to the USGS stream gage
- Urban, which includes the area between the USGS stream gage and the San Francisco Bay.

A map of the five sub-areas, along with the locations of flow measurement stations can be seen in Figure 12.

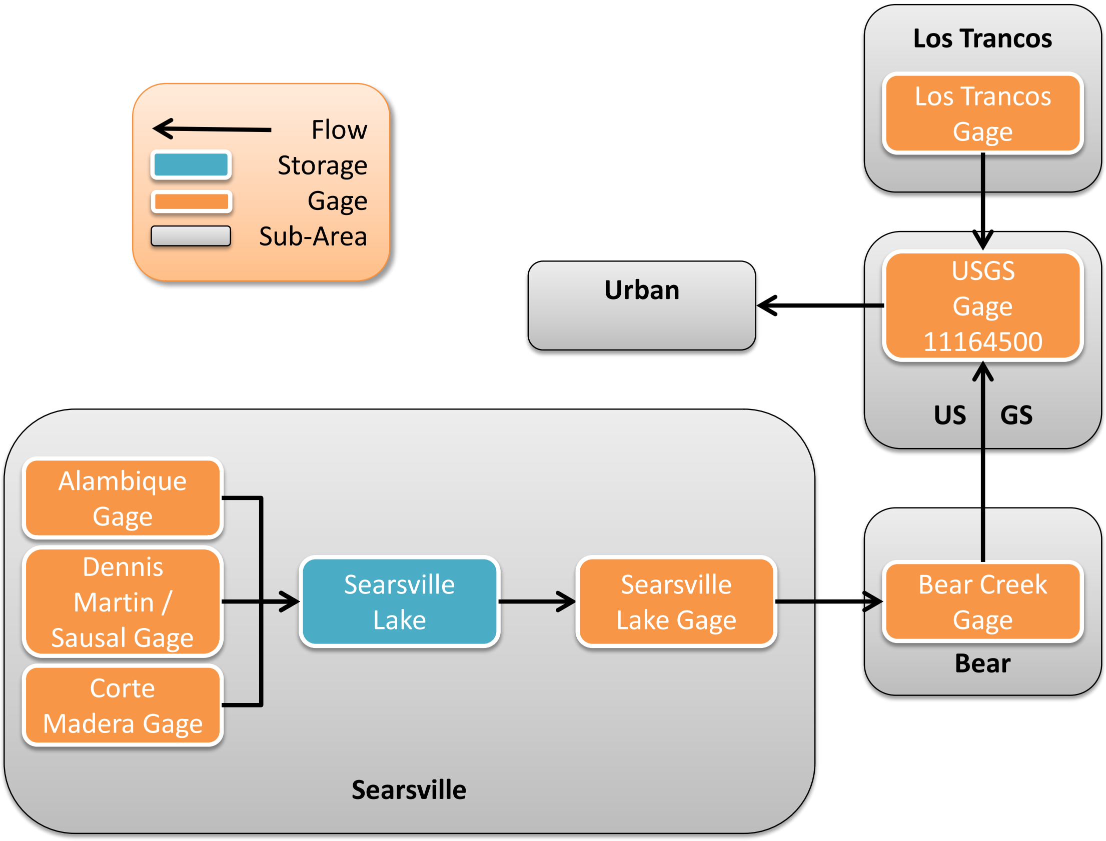


Figure 7: Calibration Sub-Areas

3.3. STREAM GAGE ERRORS

Recorded stream gage data in 2010 and 2011 from Balance are suspiciously low compared to flows measured at the downstream USGS gage. Almost all the runoff is contributed by the majority of the upstream hill watershed, which also gets the most rain. In 2012 and 2006, the total of all the Balance gages was very close to the USGS gage, as shown in Figure 8 and Figure 9. However, in 2011 and 2010, a large amount of flow is missing, shown in Figure 10 and Figure 11. It is likely that there was error in flow measurements from Balance under these circumstances. Therefore, observed Balance stream gate data points for 2011 and 2010 will be used for reference only.

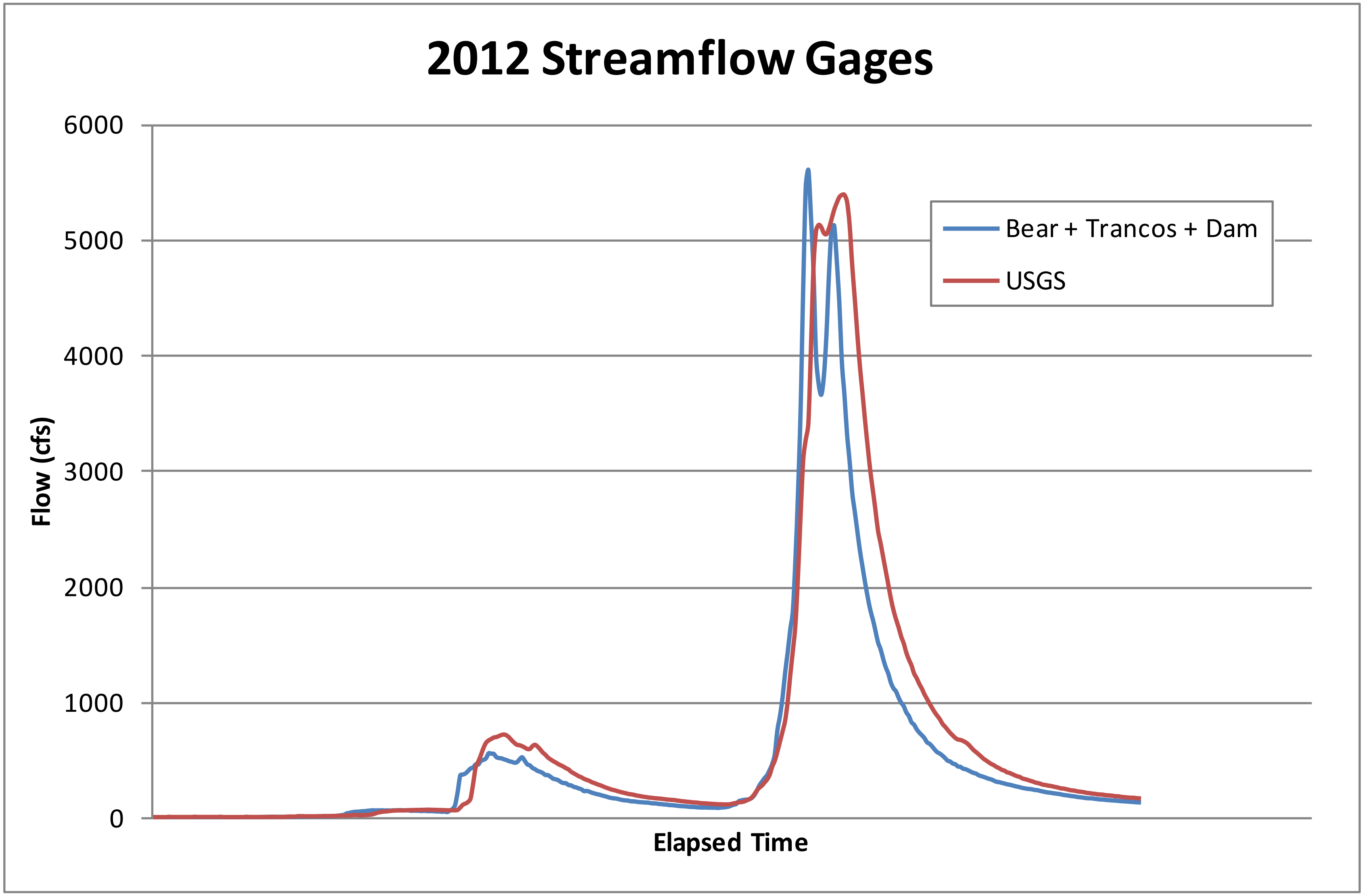


Figure 8: 2012 Streamflow Gage Comparison

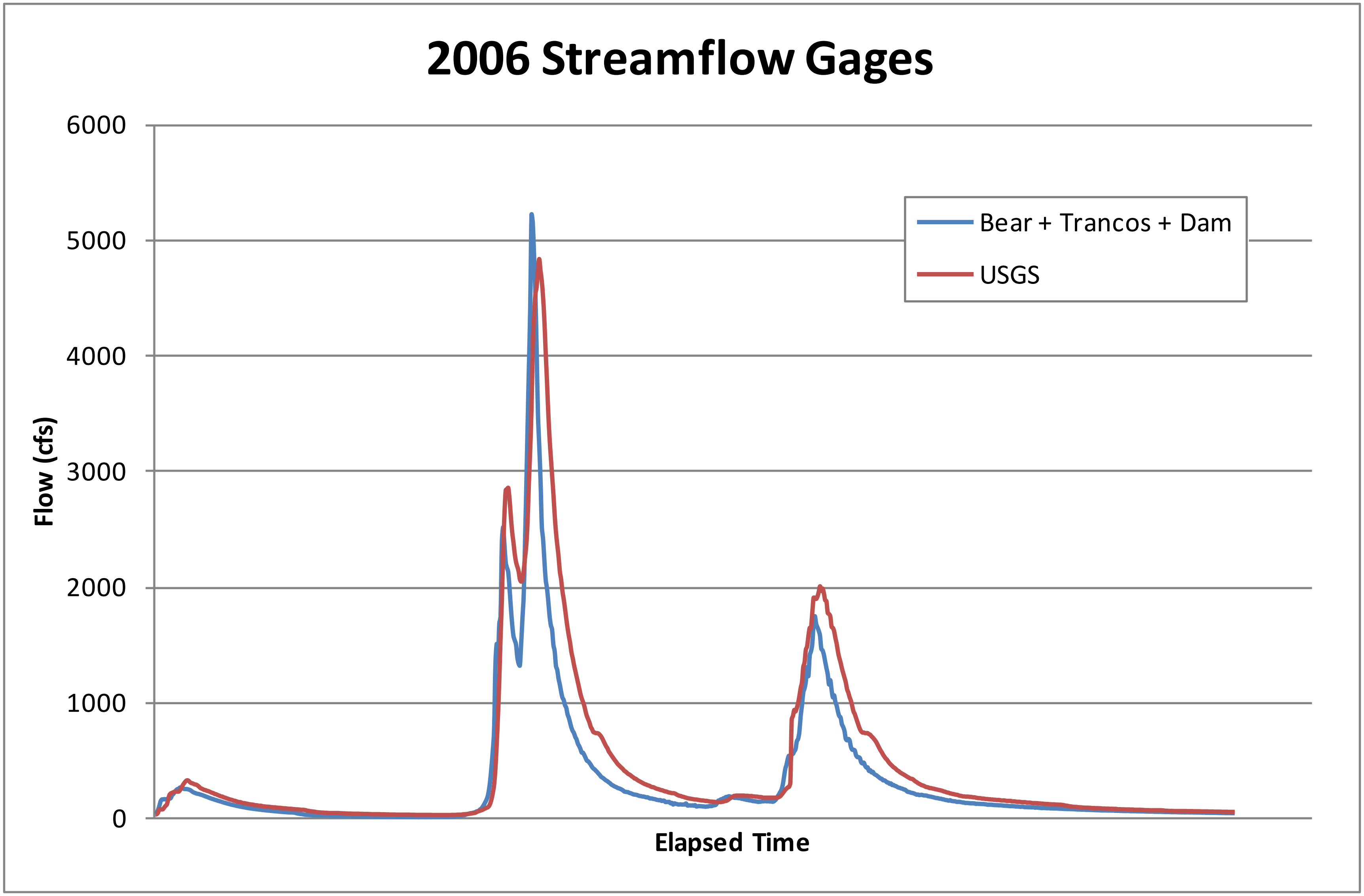


Figure 9: 2006 Streamflow Gage Comparison

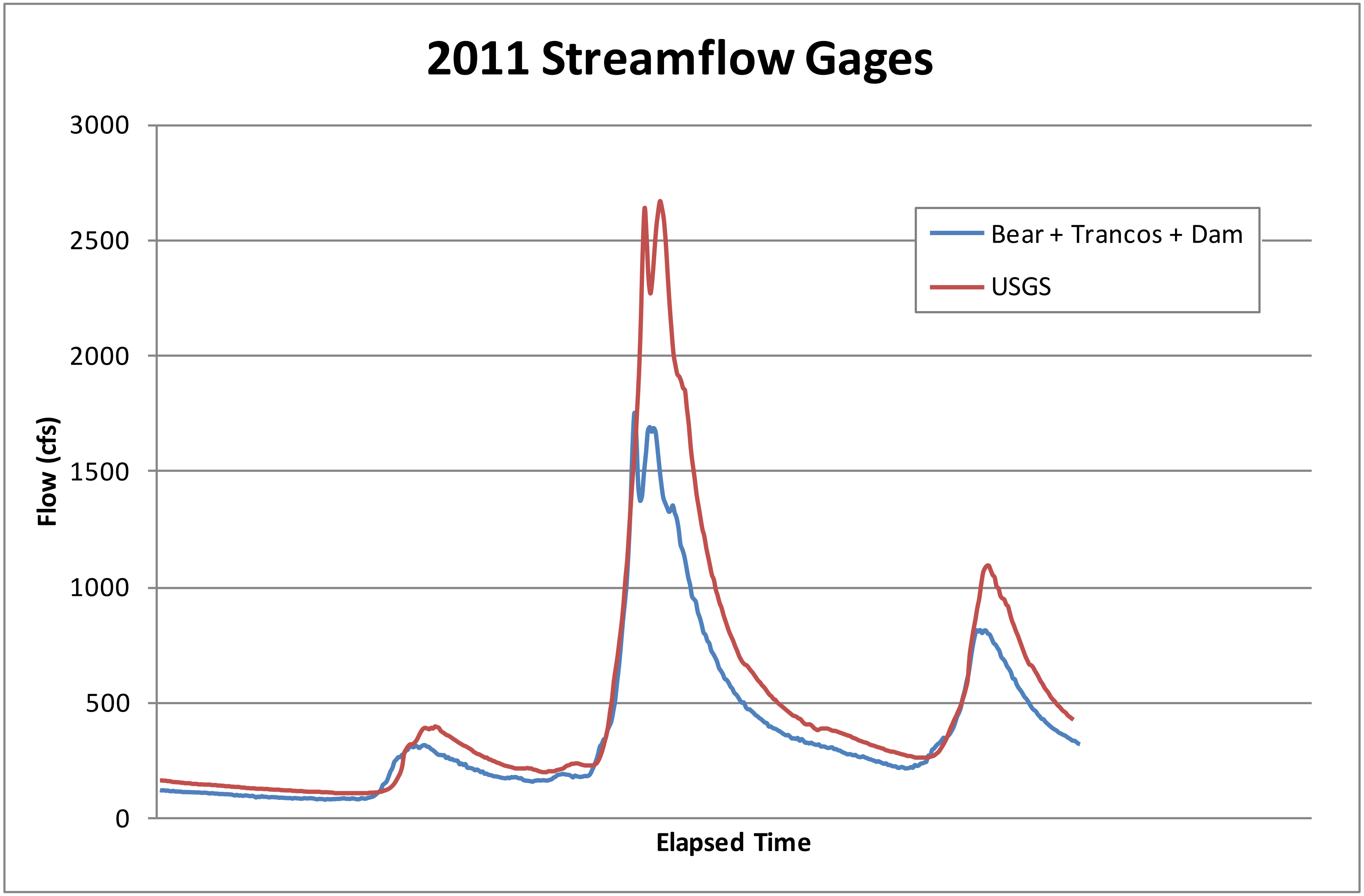


Figure 10: 2011 Streamflow Gage Comparison

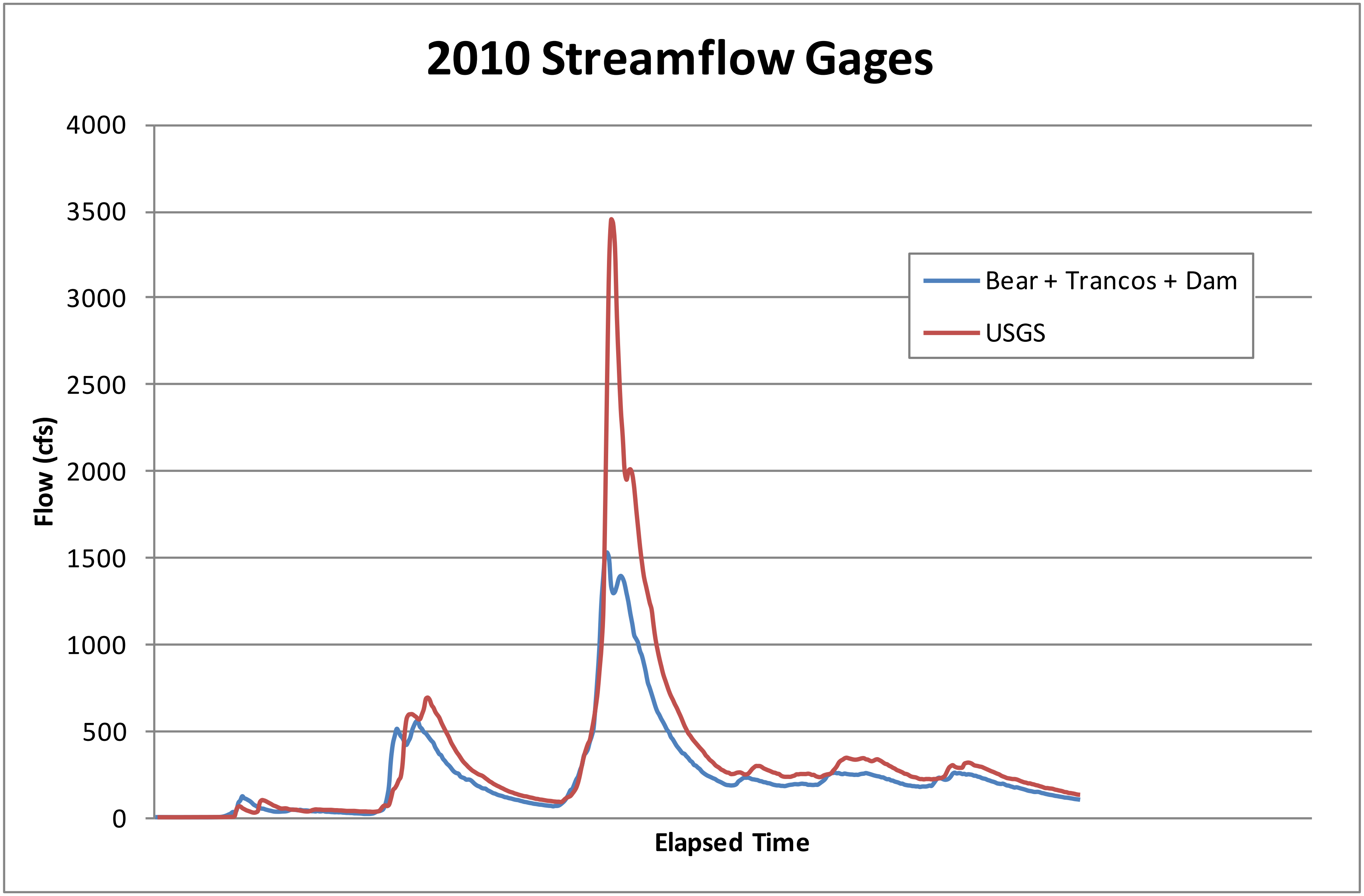


Figure 11: 2010 Streamflow Gage Comparison

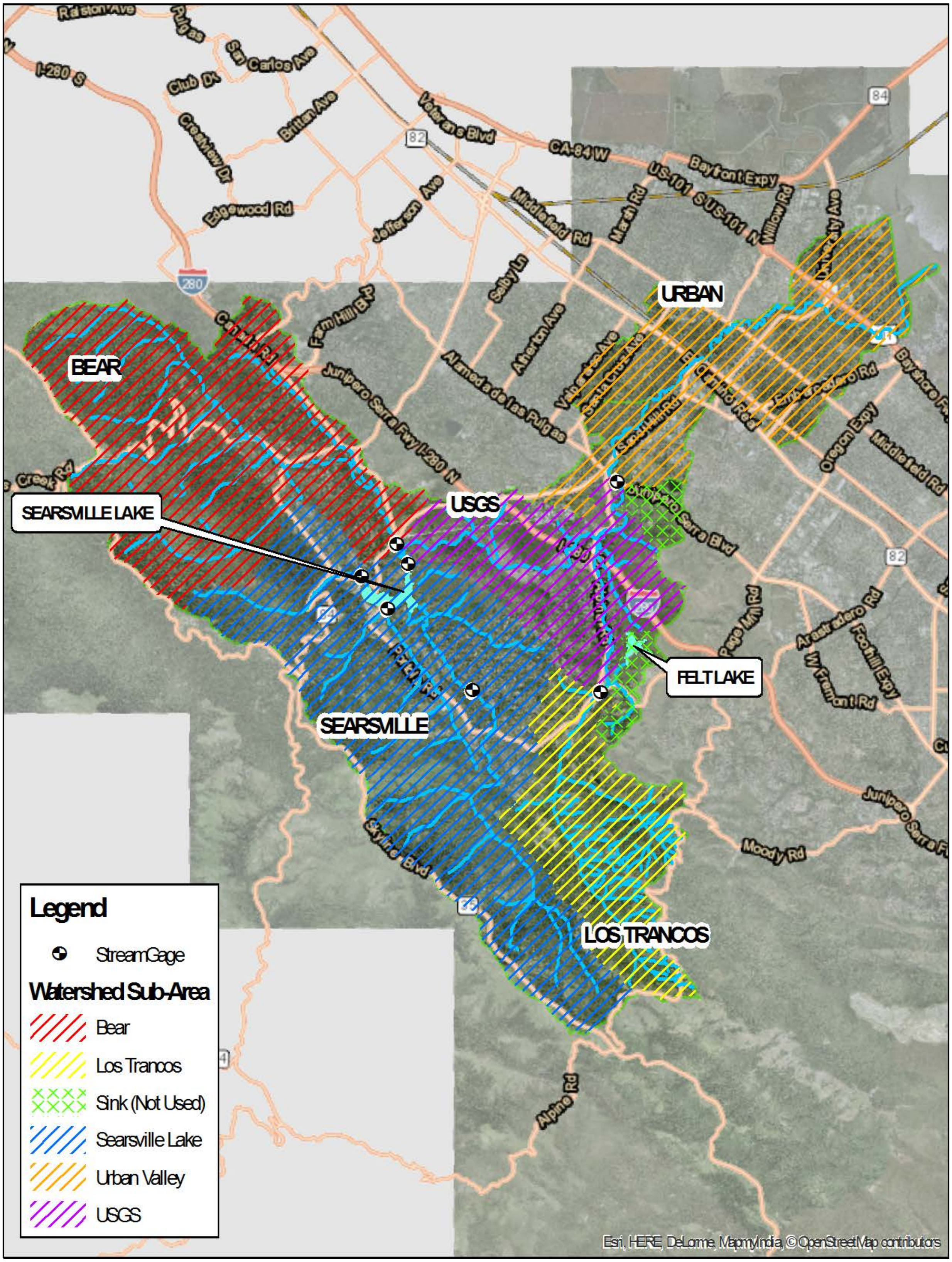


Figure 12: Basin Map

4. CALIBRATION AND VERIFICATION RESULTS

4.1. 02 FEBRUARY 1998

Table 2: February 1998 Model Calibration Parameters

Sub-Area	AMC	Time of Concentration Q*	Storage Coefficient (R) Ratio
Bear	2.25	Q25	0.5
Searsville	1.75	Q10	0.5
Los Trancos	2.0	Q25	0.5
USGS	2.0	Q25	0.5
Urban	2.0	Q25	0.5

**As described in Section 2.3.5 – numbers are based of observed flows at gaging points.*

Three gage locations were in operation for this storm event: USGS, Searsville Lake, and Los Trancos. Since Searsville Lake has already been calibrated, and no gages were in operation upstream of the dam, the observed gage outflow from the dam will be used as input for this calibration event. A 1.75 AMC value for Searsville with a slightly lower time of concentration flow matched well for the 2D model calibration. Flow at the USGS gage matched well.

The peak timing for the Los Trancos gage is slightly later for the modeled result. However, this gage experienced backwater from the downstream fish ladder according to notes by Balance Hydrology. Therefore, this reading serves only as a reference.

The peak timing for the USGS gage is also slightly later for the modeled result and there is slightly less volume in the front end of the hydrograph. However, the calibration results are acceptable. The Bear sub-area antecedent moisture condition (AMC) was increased slightly to 2.25 to bring flows at the USGS gage up to observed values.

Observed flows are in black. Modeled flows are shown in blue. A reference rainfall pattern over Searsville Lake is included under the hydrographs.

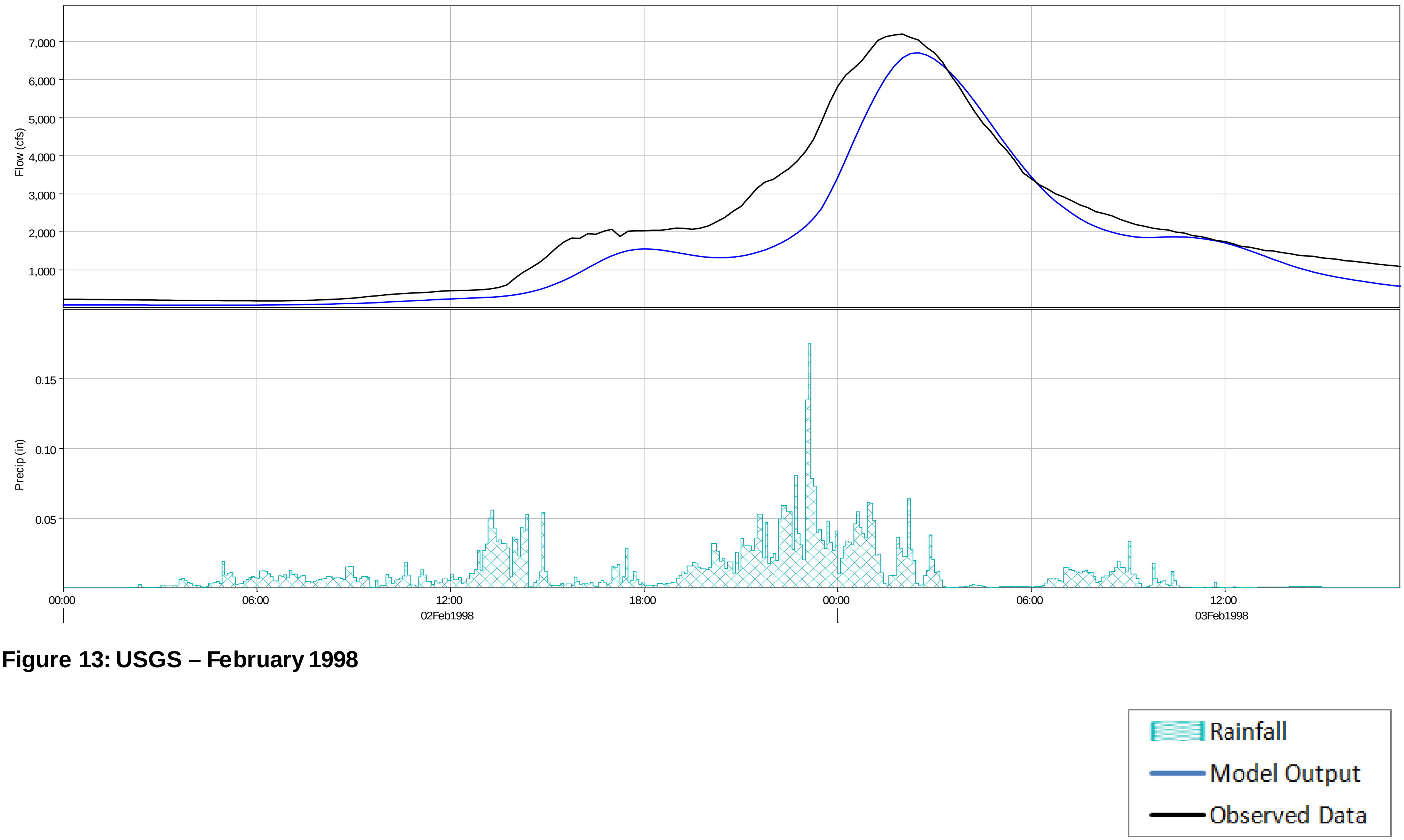


Figure 13: USGS – February 1998

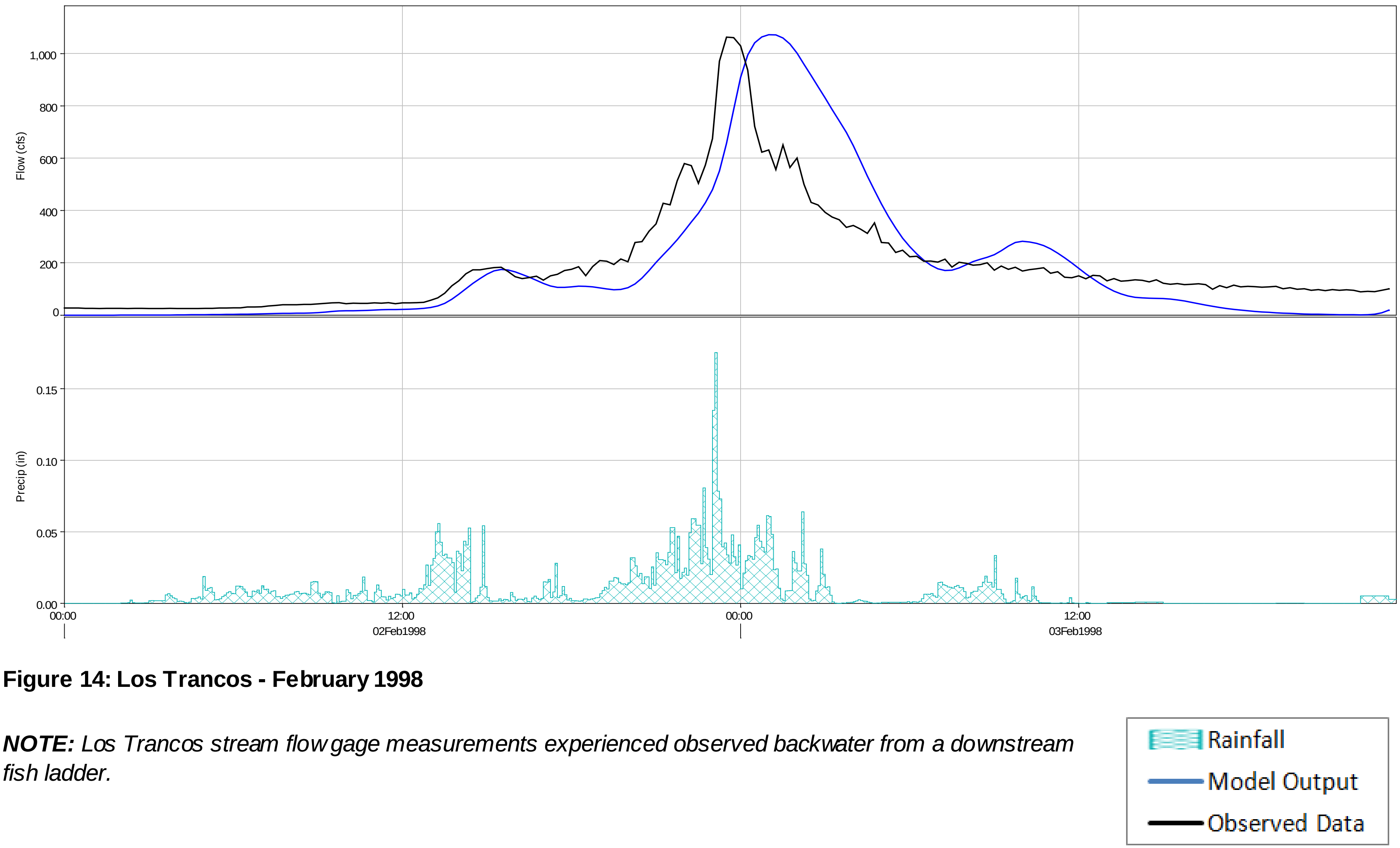


Figure 14: Los Trancos - February 1998

NOTE: *Los Trancos stream flow gage measurements experienced observed backwater from a downstream fish ladder.*

4.2. 12 FEBRUARY 2000

Table 3: February 2000 Model Calibration Parameters

Sub-Area	AMC	Time of Concentration Q	Storage Coefficient (R) Ratio
Bear	2.75	Q10	0.5
Searsville	2.0	Q10	0.5
Los Trancos	1.75	Q5	0.5
USGS	2.0	Q10	0.5
Urban	2.0	Q10	0.5

**As described in Section 2.3.5 – numbers are based of observed flows at gaging points.*

Three gage locations were in operation for this storm event: USGS, Bear, and Los Trancos. Searsville Lake observed outflow was not available for this date so the 2D hydraulic model was used to supplement. The hydrologic model was run with the parameters shown above, and the output hydrographs upstream of Searsville Lake were used as flow inputs into the 2D model. The resulting 2D spill from Searsville Dam was used as input into the hydrologic model to complete the calibration.

The Bear gage required a very high AMC value of 2.75 to reach the flows observed from the gage. It is suspected that poor rainfall data is to blame. Downstream, observed gage data was used as input. Los Trancos Creek experienced little flow comparatively.

The recorded USGS gage hydrograph has more volume and peak flow than the model. Since most of the flow is controlled by the inputs of Bear, Searsville, and Los Trancos, it is suspected that a combination of low rainfall data affecting runoff volume (evidenced by Bear) and observed stream gage data that is slightly off. Overall, the timing and peak still match well.

Observed flows are in black. Modeled flows are shown in blue. A reference rainfall pattern over Searsville Lake is included under the hydrographs.

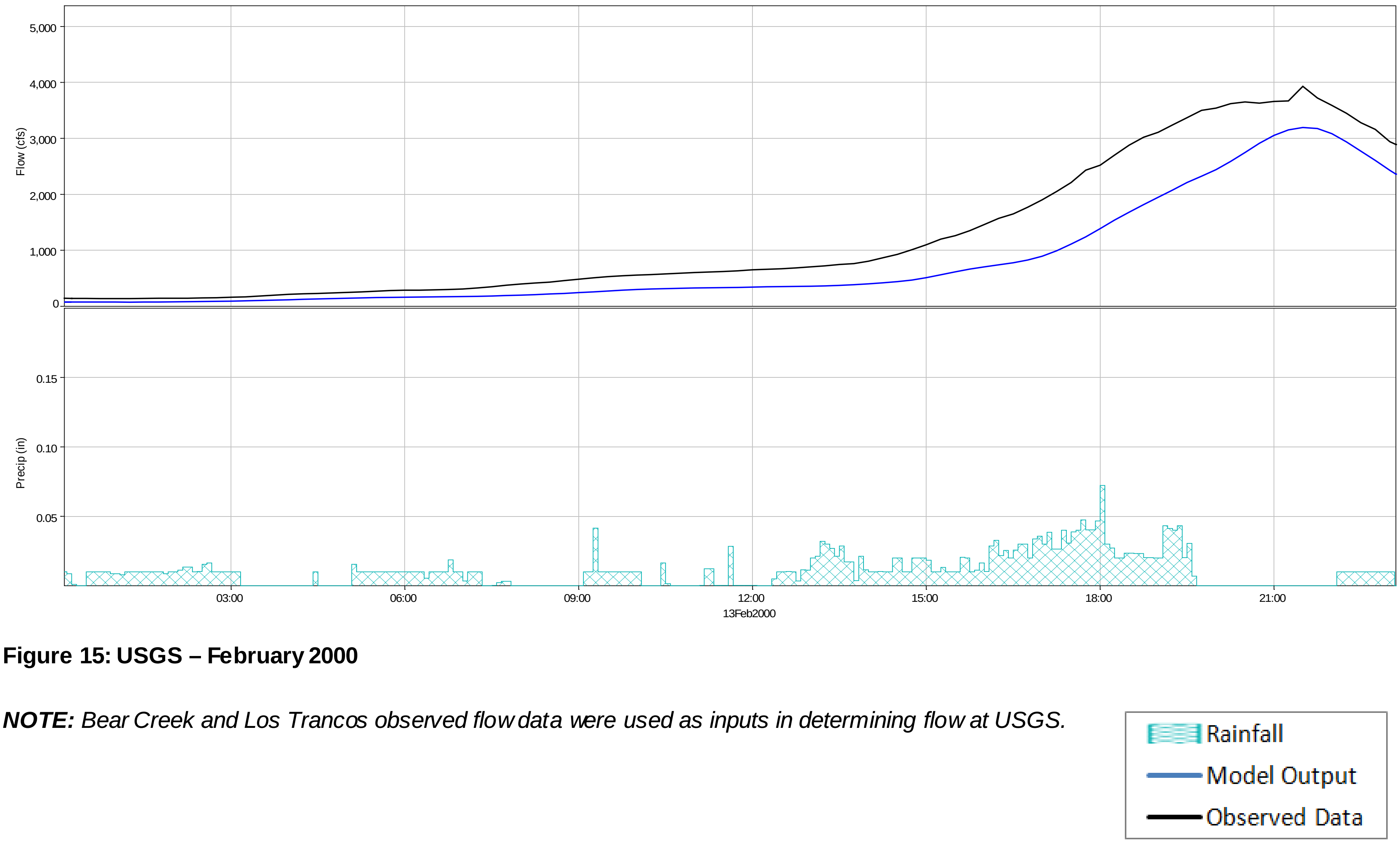


Figure 15: USGS – February 2000

NOTE: *Bear Creek and Los Trancos observed flow data were used as inputs in determining flow at USGS.*

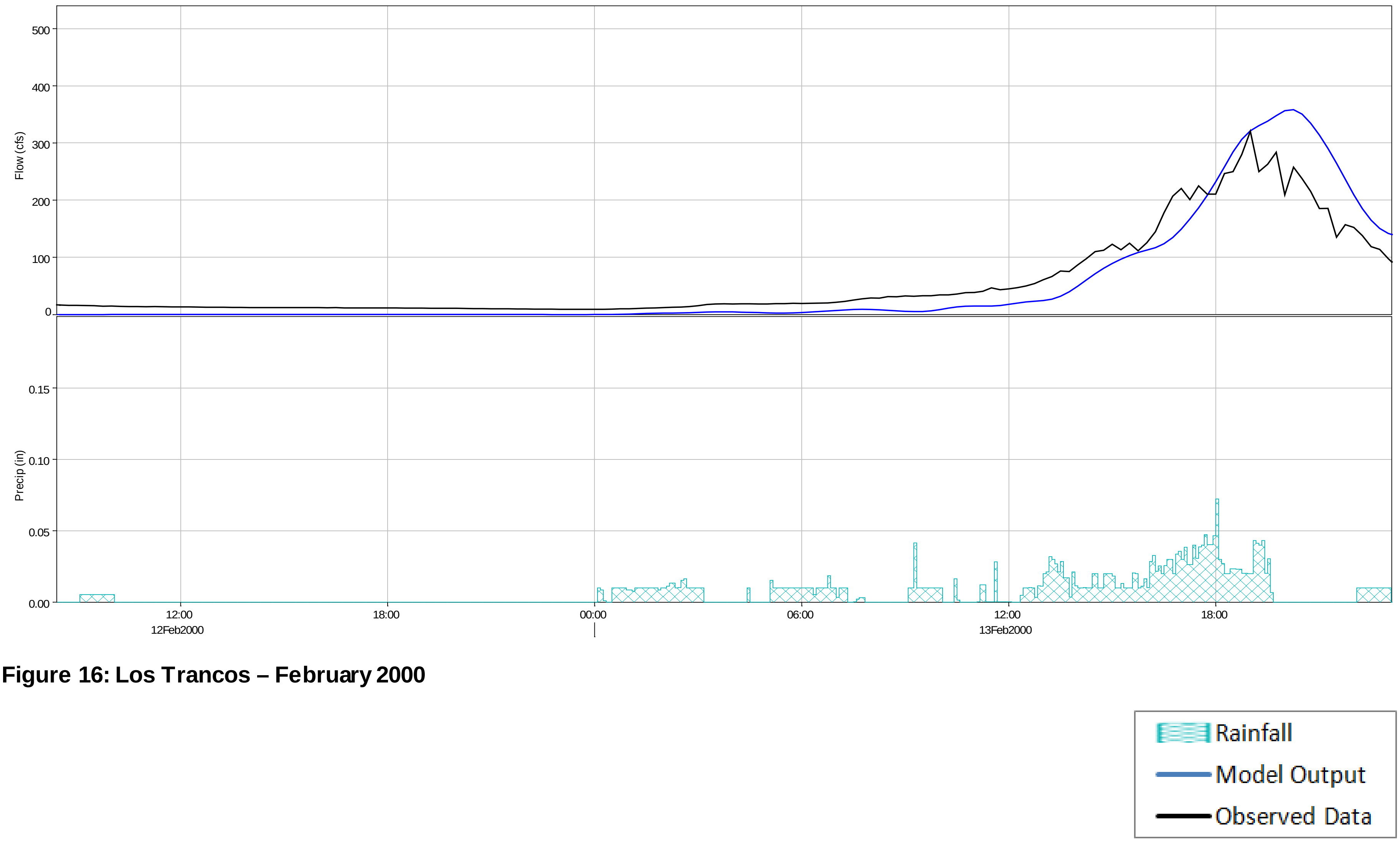


Figure 16: Los Trancos – February 2000

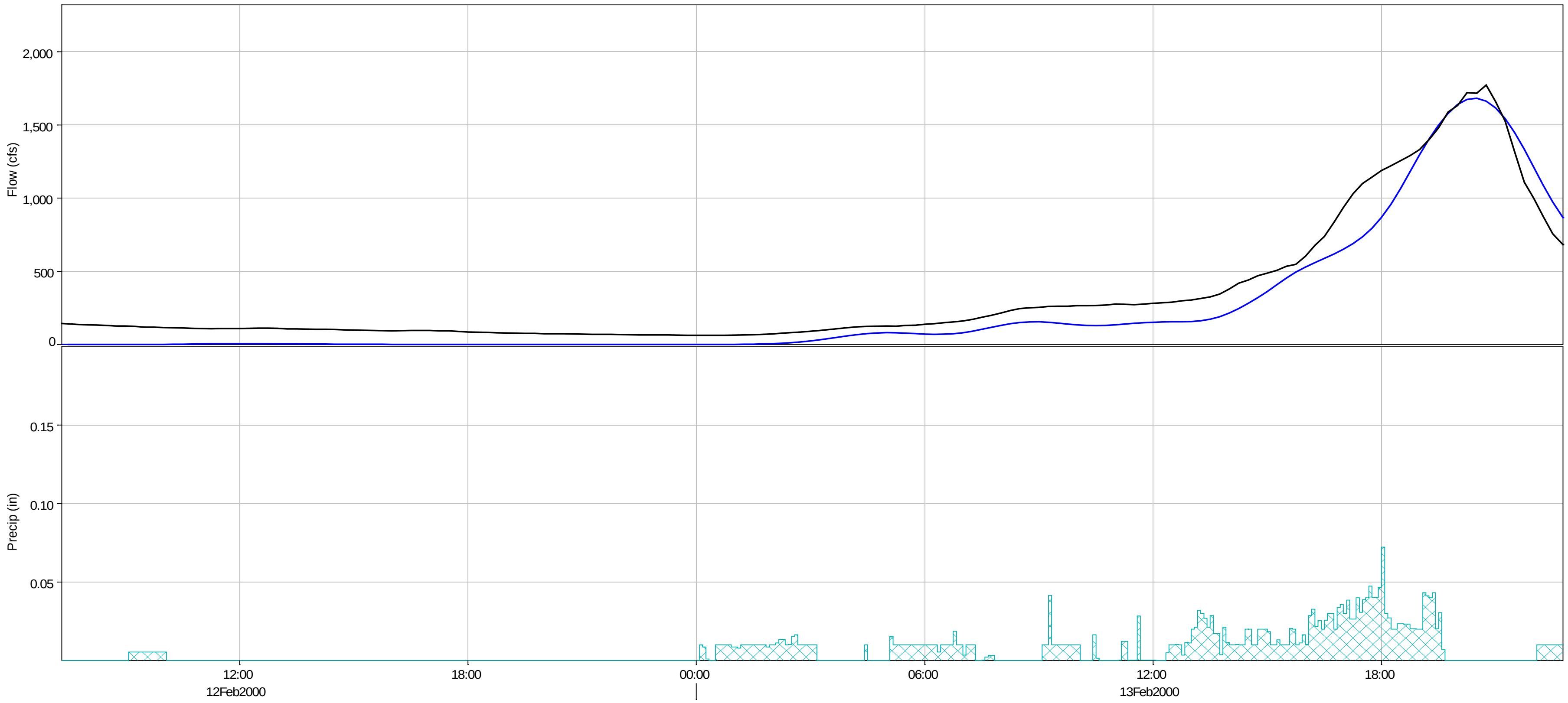
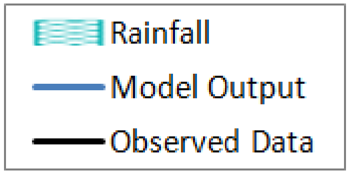


Figure 17: Bear – February 2000



4.3. 18 JANUARY 2010

Table 4: January 2010 Model Calibration Parameters

Sub-Area	AMC	Time of Concentration Q	Storage Coefficient (R) Ratio
Bear	2.0	Q10	0.5
Searsville	1.75	Q10	0.5
Los Trancos	2.0	Q10	0.5
USGS	2.0	Q10	0.5
Urban	2.0	Q10	0.5

**As described in Section 2.3.5 – numbers are based of observed flows at gaging points.*

Five gage locations were in operation for this storm event: USGS, Searsville Dam, Bear, Corte Madera, and Los Trancos. From previous discussion about possible gage errors stemming from Bear and Los Trancos, the observed flow from these gages were not used as inputs. Downstream reference points relied solely on the model.

Using the Searsville recorded outflow, combined with Bear and Los Trancos watersheds at an AMC of 2.0, the modeled flow at the USGS gage matched well with the observed data.

For the Searsville watershed, the only operational gage upstream was Corte Madera. The catch point in the model is downstream of the gage, and therefore a higher modeled flow would be expected. An AMC value of 1.75 computed a flow that is slightly larger than recorded.

Observed flows are in black. Modeled flows are shown in blue. A reference rainfall pattern over Searsville Lake is included under the hydrographs.

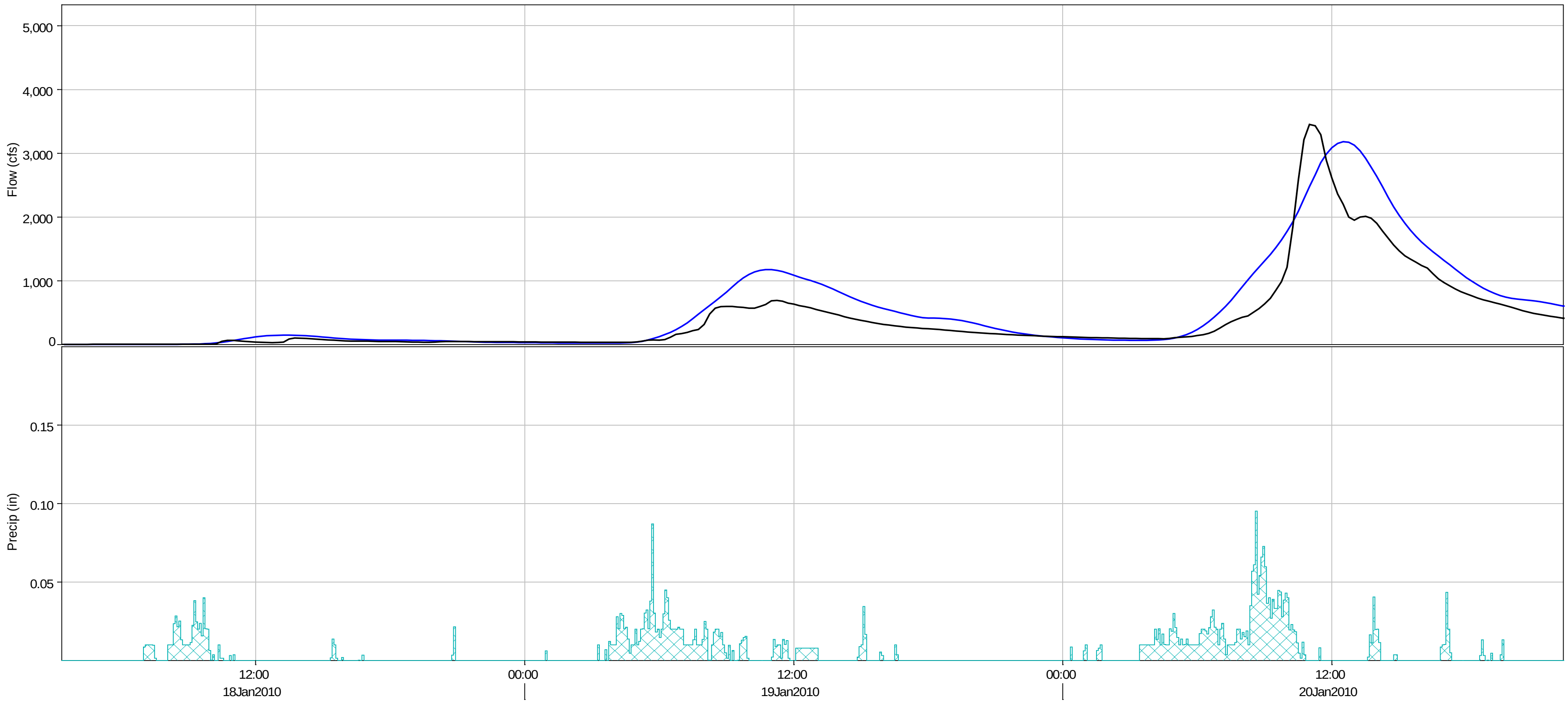
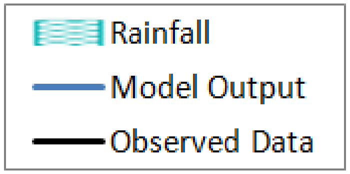


Figure 18: USGS – January 2010



NOTE: *Bear Creek and Los Trancos observed flow data were removed and not used as inputs in determining flow at USGS.*

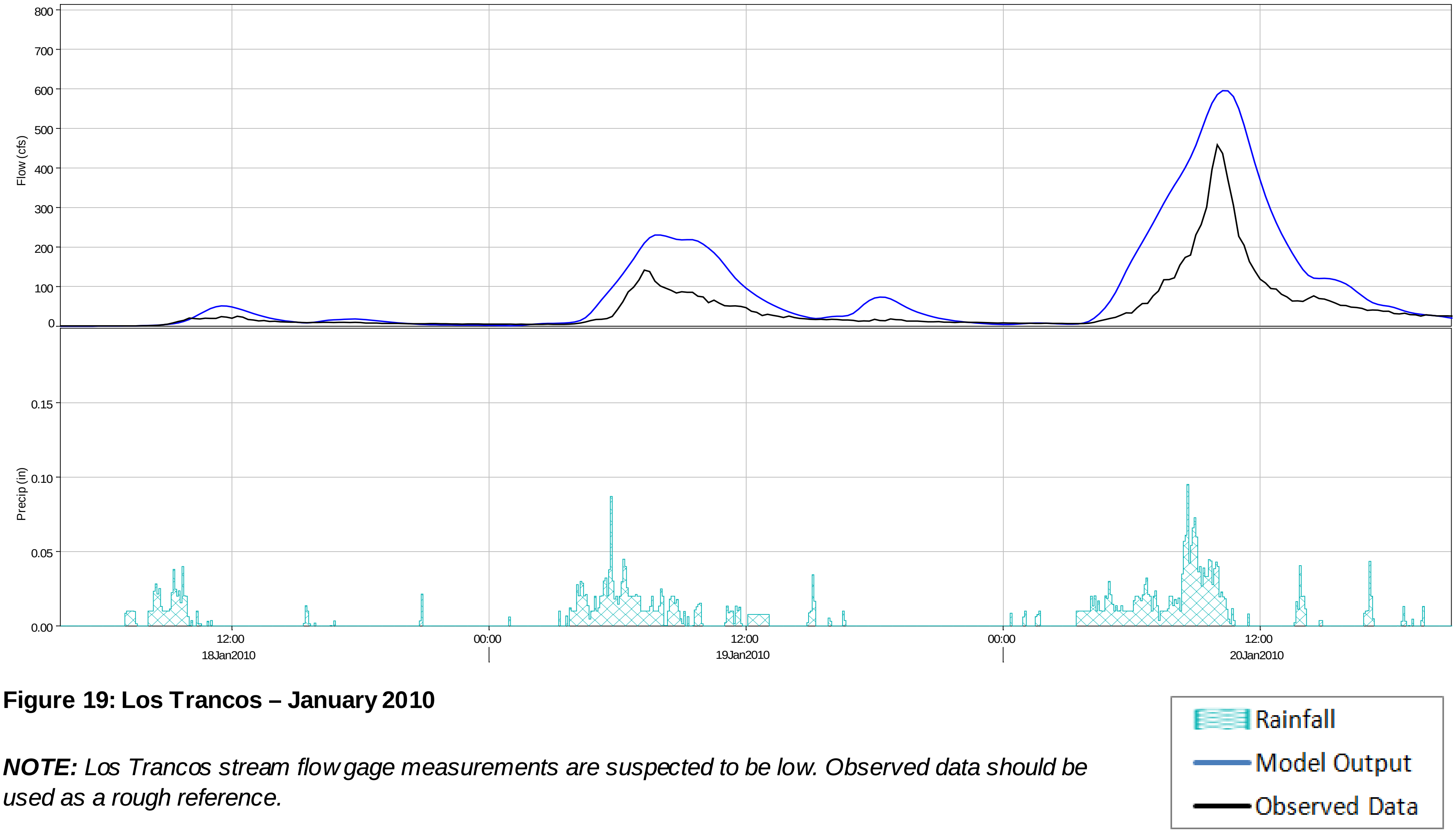


Figure 19: Los Trancos – January 2010

NOTE: *Los Trancos stream flow gage measurements are suspected to be low. Observed data should be used as a rough reference.*

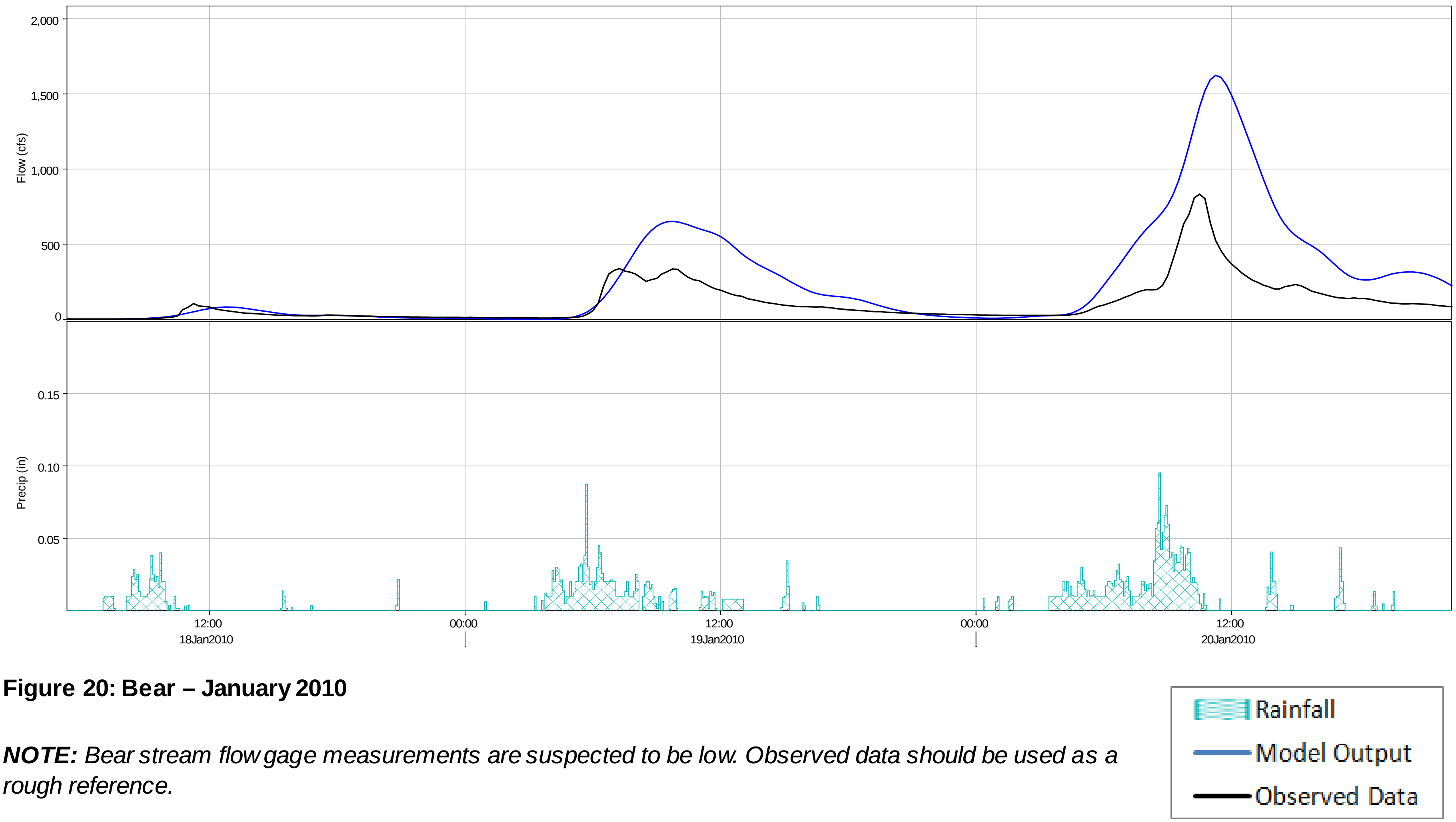


Figure 20: Bear – January 2010

NOTE: *Bear stream flow gage measurements are suspected to be low. Observed data should be used as a rough reference.*

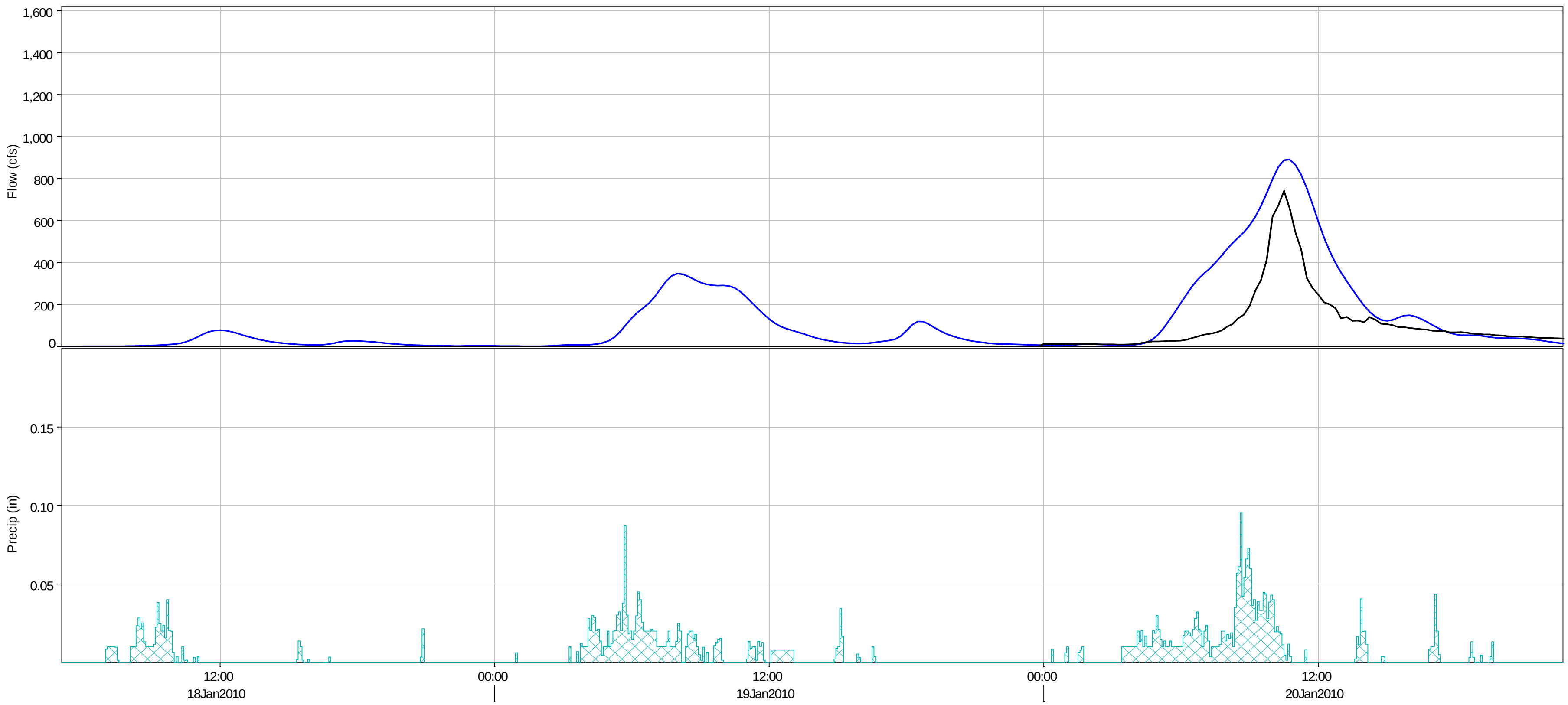
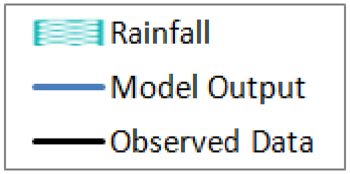


Figure 21: Corte Madera – January 2010



NOTE: *Stream gage located upstream of model catch point. Observed flow should be slightly lower than the model results.*

4.4. 22 MARCH 2011

Table 5: March 2011 Model Calibration Parameters

Sub-Area	AMC	Time of Concentration Q	Storage Coefficient (R) Ratio
Bear	2.0	Q10	0.5
Searsville	1.75	Q10	0.5
Los Trancos	2.0	Q10	0.5
USGS	2.0	Q10	0.5
Urban	2.0	Q10	0.5

**As described in Section 2.3.5 – numbers are based of observed flows at gaging points.*

Five gage locations were in operation for this storm event: USGS, Searsville Dam, Bear, Corte Madera, and Los Trancos. Similar to the 2010 calibration, there are possible gage errors stemming from Bear and Los Trancos. Therefore, the observed flows from these gages were not used as inputs. Downstream reference points relied solely on the model. However, Los Trancos gage matched perfectly with modeled output without any effort, which puts suspicion on the Bear gage.

Using the Searsville outflow, combined with Bear and Los Trancos watersheds at AMC 2.0, the modeled flow at the USGS gage matched very well with the observed data.

For the Searsville watershed, the only operational gage upstream was Corte Madera. The catch point in the model is downstream of the gage, and therefore a higher modeled flow would be expected. An AMC value of 1.75 computed a flow that is slightly larger than observed.

Observed flows are in black. Modeled flows are shown in blue. A reference rainfall pattern over Searsville Lake is included under the hydrographs.

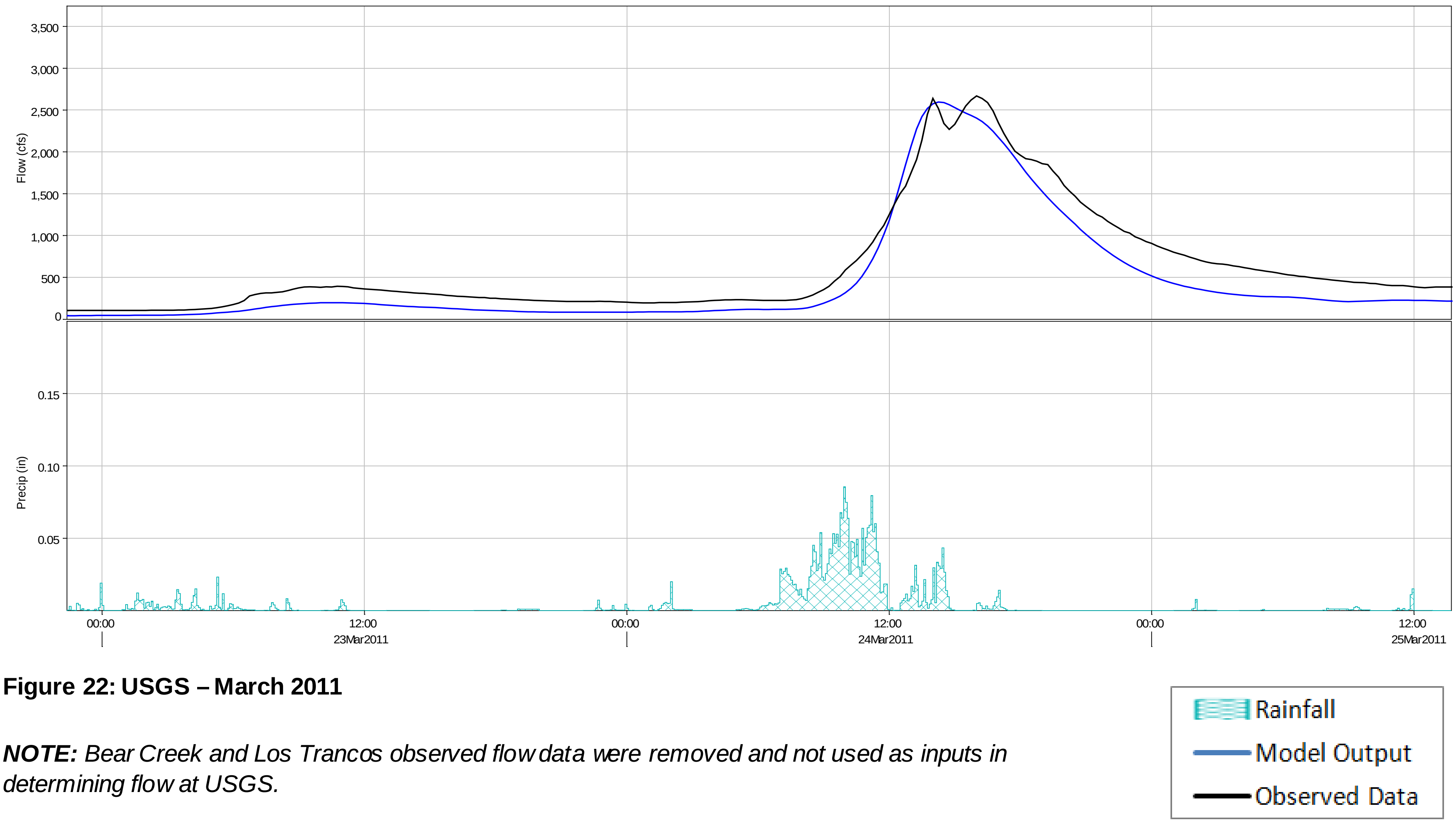


Figure 22: USGS – March 2011

NOTE: *Bear Creek and Los Trancos observed flow data were removed and not used as inputs in determining flow at USGS.*

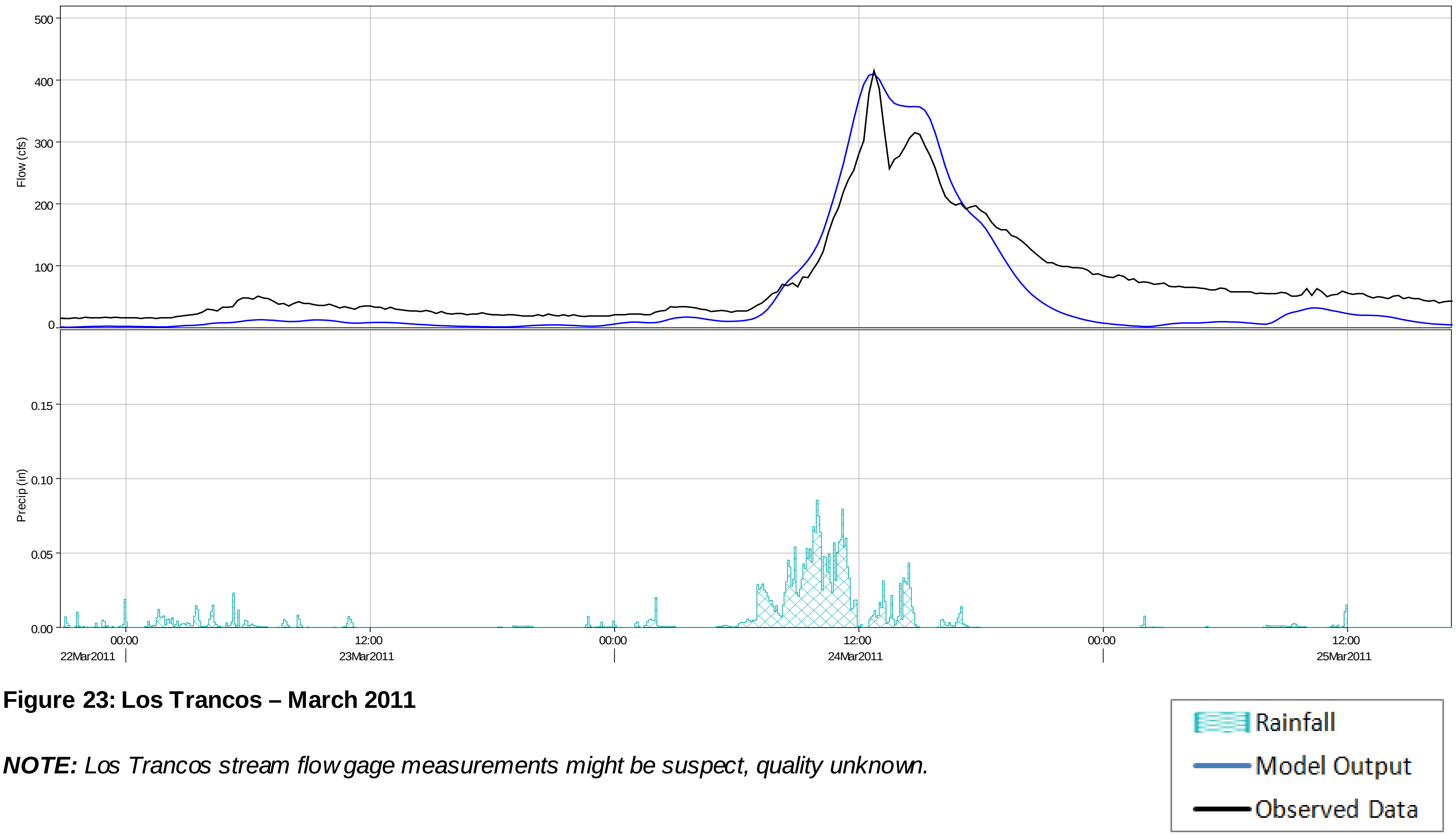


Figure 23: Los Trancos – March 2011

NOTE: *Los Trancos stream flow gage measurements might be suspect, quality unknown.*

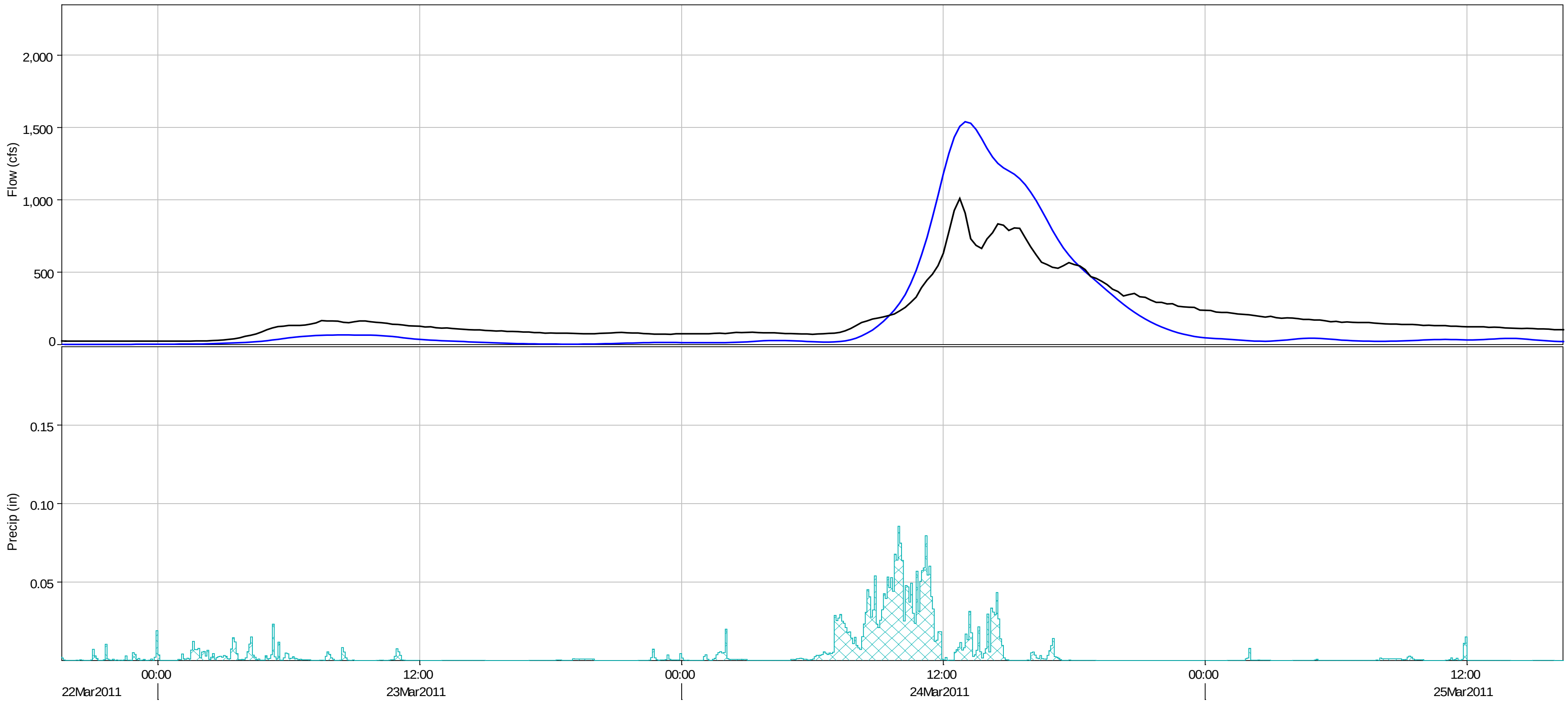
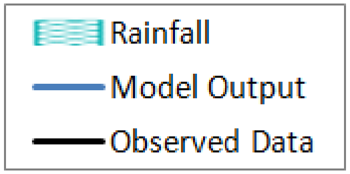


Figure 24: Bear – March 2011



NOTE: *Bear stream flow gage measurements are suspected to be low. Observed data should be used as a rough reference.*

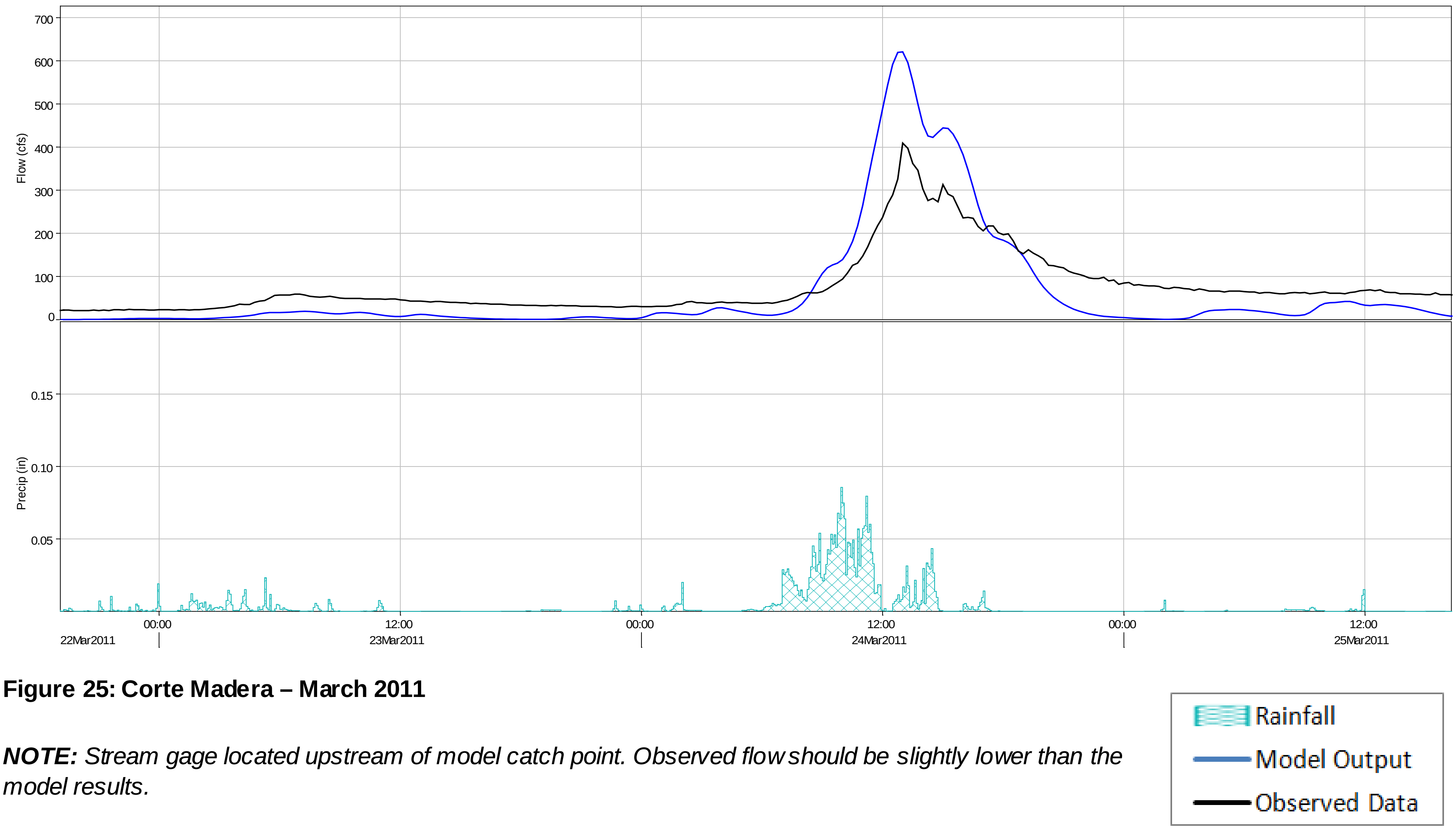


Figure 25: Corte Madera – March 2011

NOTE: *Stream gage located upstream of model catch point. Observed flow should be slightly lower than the model results.*

4.5. 21 DECEMBER 2012

Table 6: December 2012 Model Calibration Parameters

Sub-Area	AMC	Time of Concentration Q	Storage Coefficient (R) Ratio
Bear	2.5	Q200	0.5
Searsville	1.5 – 2.0	Q10	0.5
Los Trancos	1.5	Q10	0.5
USGS	2.0	Q10	0.5
Urban	2.0	Q10	0.5

**As described in Section 2.3.5 – numbers are based of observed flows at gaging points.*

Seven gage locations were in operation for this storm event: USGS, Searsville Dam, Bear, Corte Madera, Alambique, Dennis Martin/Sausal, and Los Trancos. Alambique gage experienced debris and clogged culvert issues, and therefore will only be used as reference. Alambique, Dennis Martin/Sausal, and Corte Madera gages are all upstream of Searsville Dam, and will be used to determine parameters for the Sub-Area Searsville.

For the Searsville watershed, Corte Madera sub-basins were given an AMC value of 2.0, while the rest of the northern sub-basins, including Alambique and Dennis Martin / Sausal, were given an AMC of 1.5 in the Searsville sub-area. This northern sub-area shares a boundary with Bear. It is likely that the rainfall error for Bear is also present in the northern Searsville sub-area as well.

The measured flow at the Bear Creek gage is very high, approaching a 200-year return period when using the USGS gage as a reference. AMC was set at 2.5, but the model could not reproduce the flows that were measured. Erroneous rainfall data is suspected, as a high stream flow at Bear is required to produce the flows seen at USGS. In addition, rainfall discrepancies are seen for sub-basins at higher elevations. This error probably stems from a District rain gage malfunction during this storm, which removed an important calibration point for the radar data. However, there is also a possibility of stream flow gage error, as the peak lasts for much longer, and the volume much higher at the USGS gage.

Using the Searsville outflow, combined with Bear and Los Trancos at an AMC 2.0, the modeled flow at the USGS gage matches the initial rising peak, but is not able to sustain the peak for very long.

Los Trancos is given an AMC of 1.5, and modeled flows are slightly higher than observed.

Observed flows are in black. Modeled flows are shown in blue. A reference rainfall pattern over Searsville Lake is included under the hydrographs.

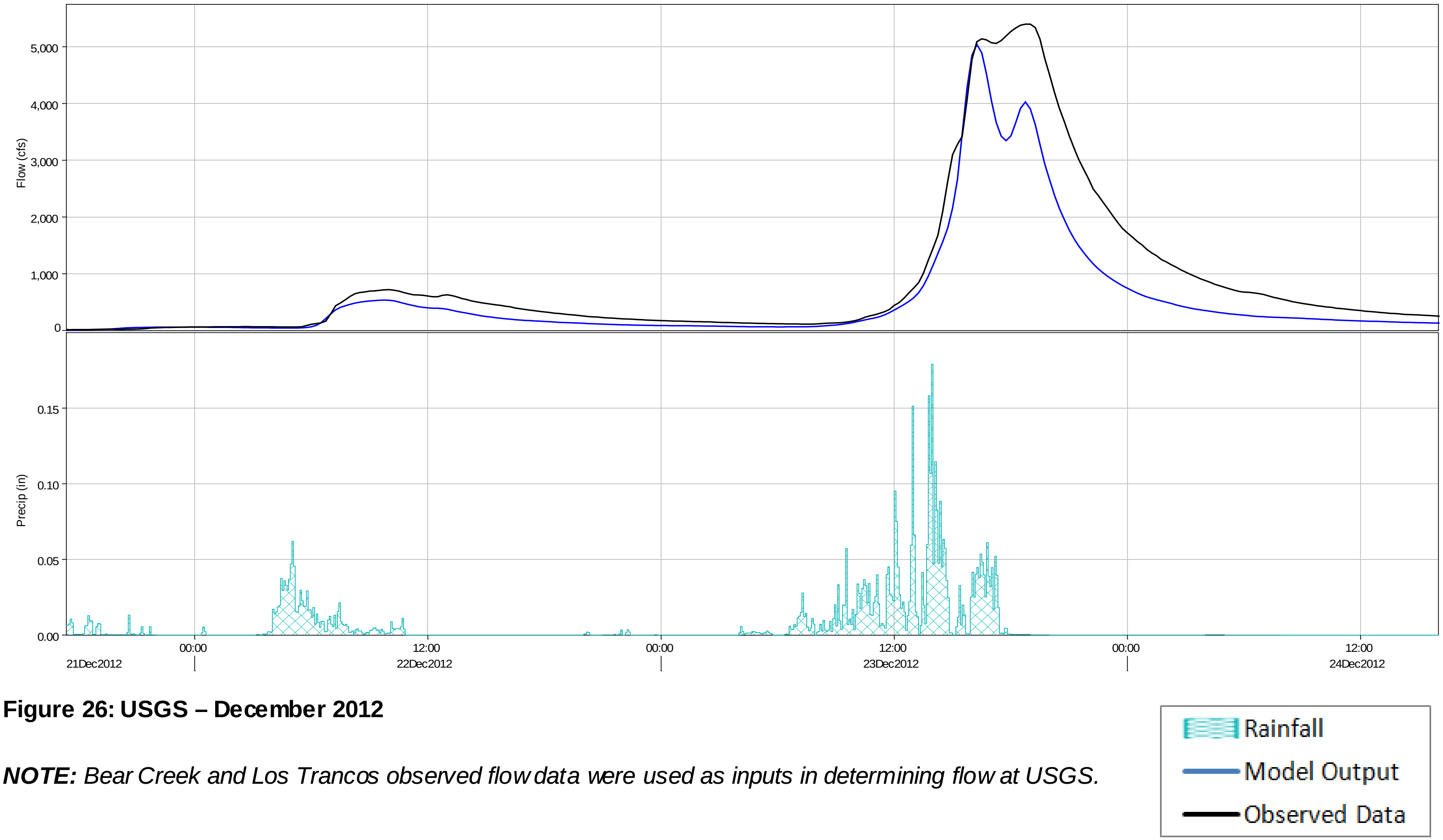


Figure 26: USGS – December 2012

NOTE: *Bear Creek and Los Trancos observed flow data were used as inputs in determining flow at USGS.*

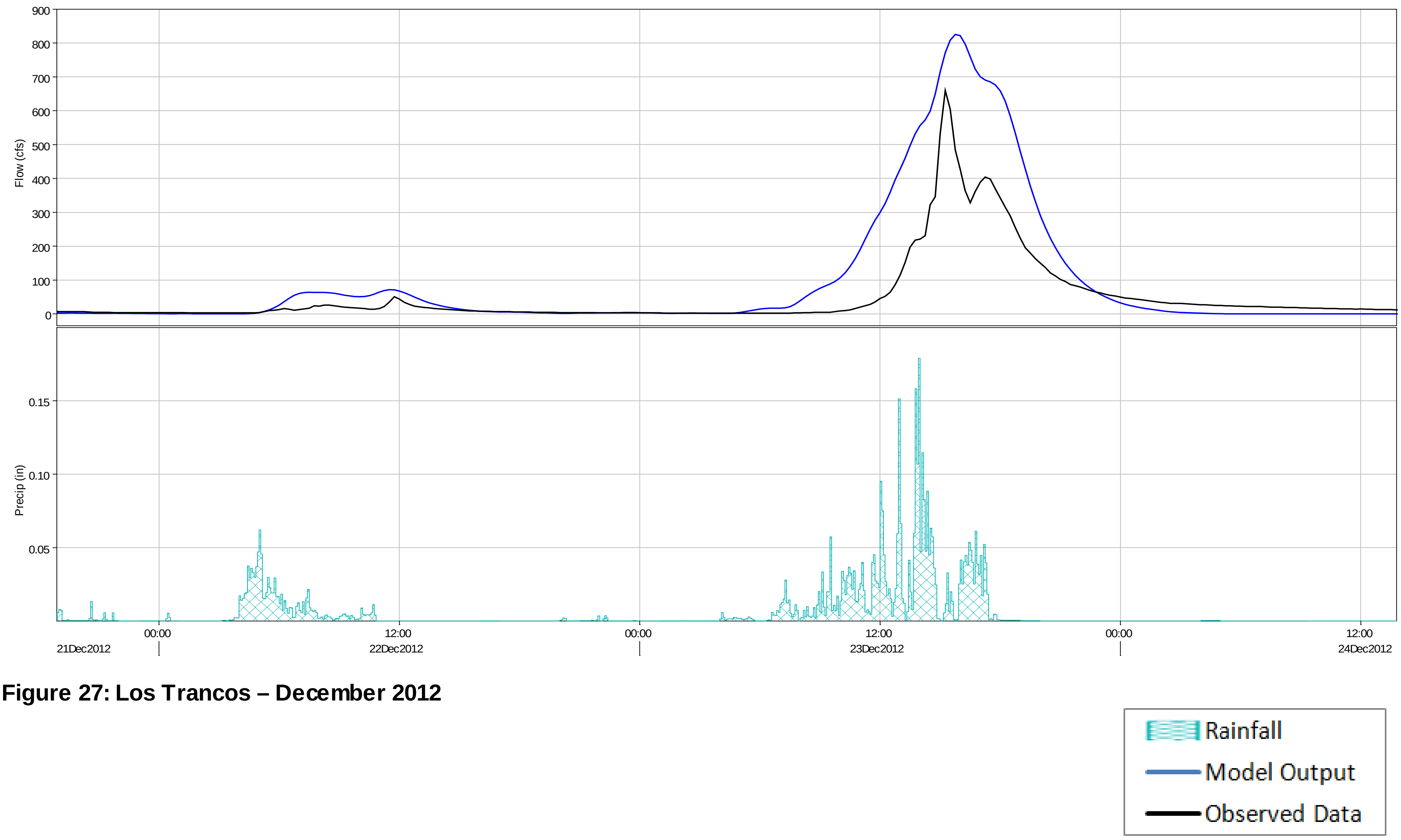


Figure 27: Los Trancos – December 2012

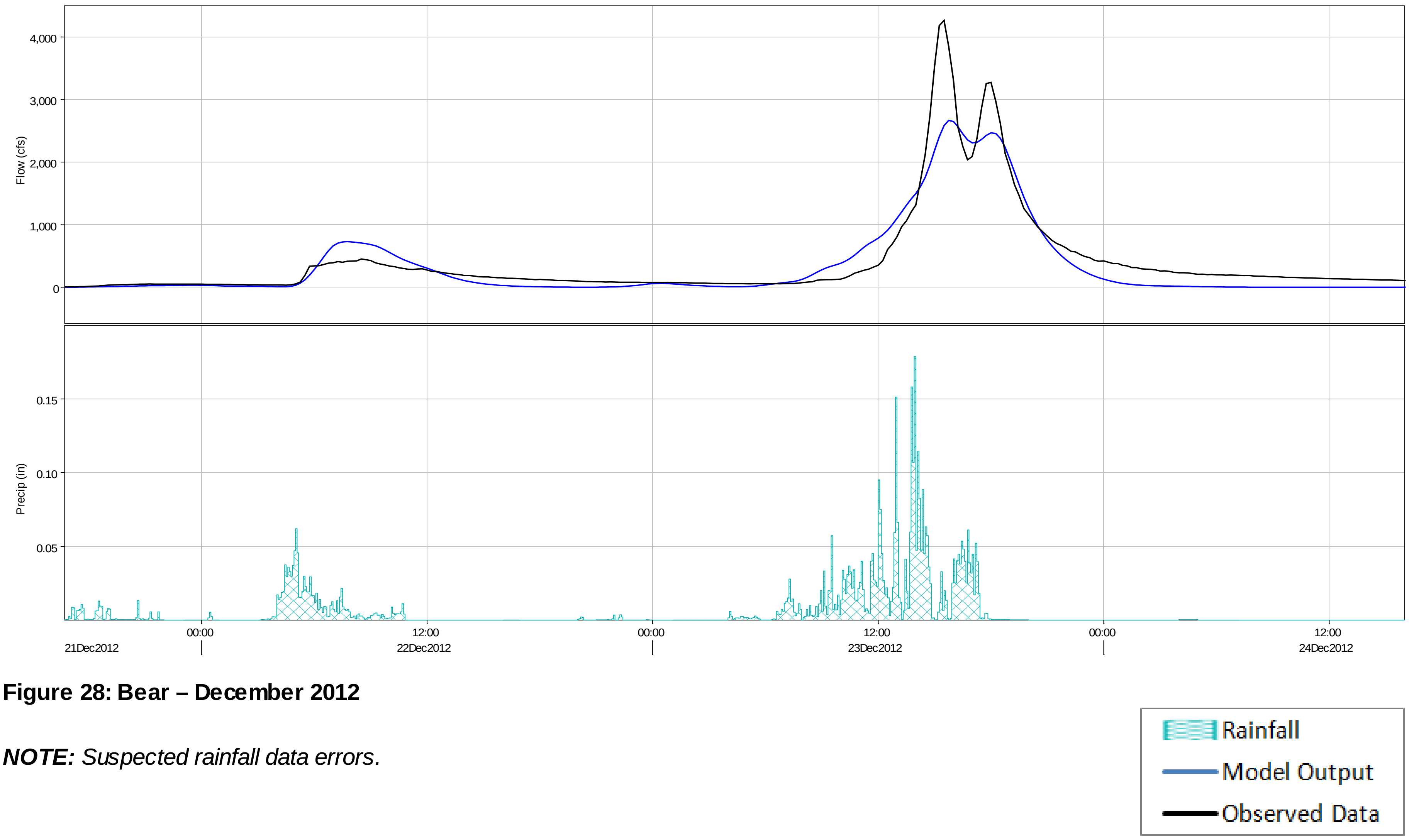


Figure 28: Bear – December 2012

NOTE: *Suspected rainfall data errors.*

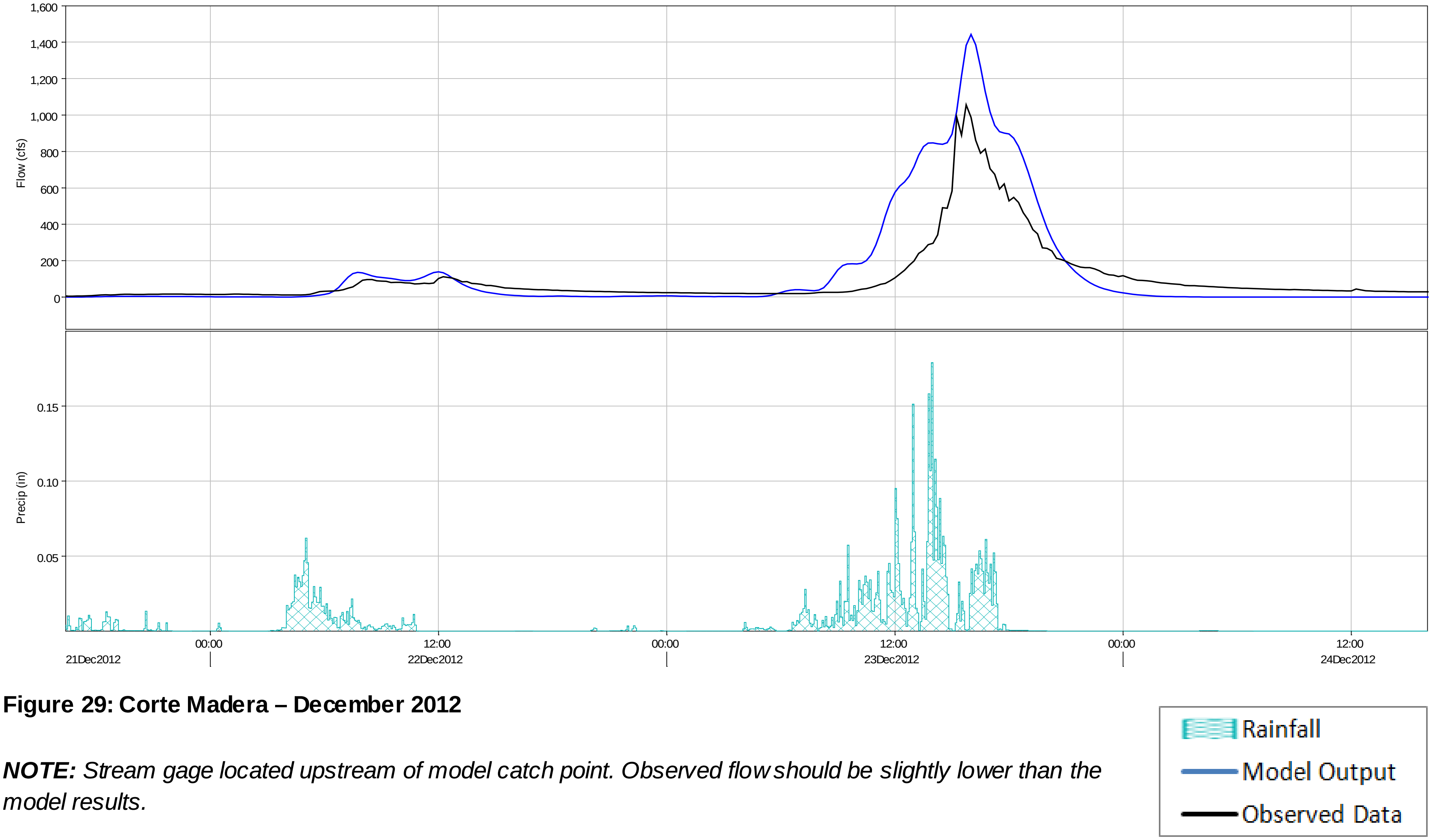


Figure 29: Corte Madera – December 2012

NOTE: *Stream gage located upstream of model catch point. Observed flow should be slightly lower than the model results.*

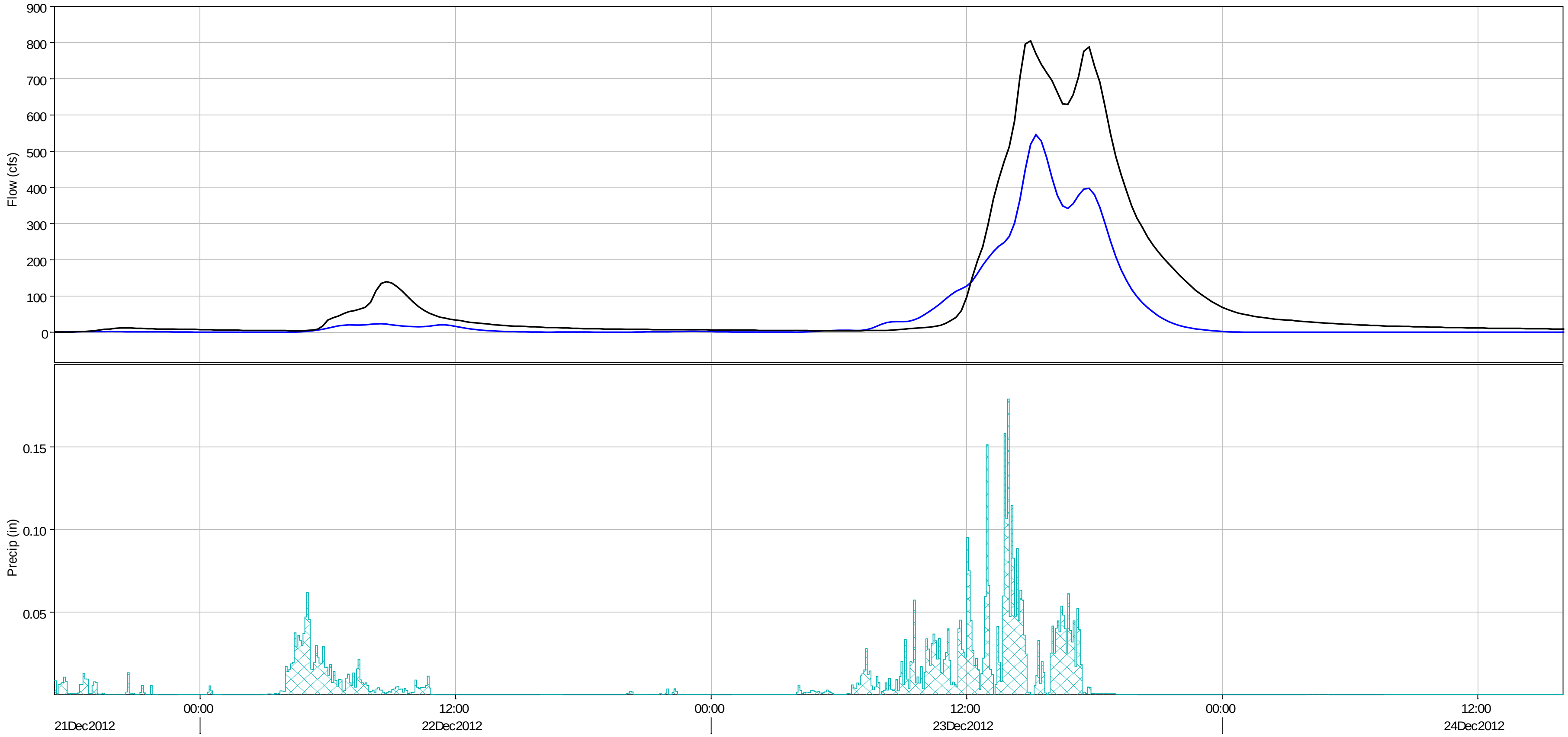


Figure 30: Dennis Martin / Sausal – December 2012

NOTE: *Suspected rainfall data errors.*

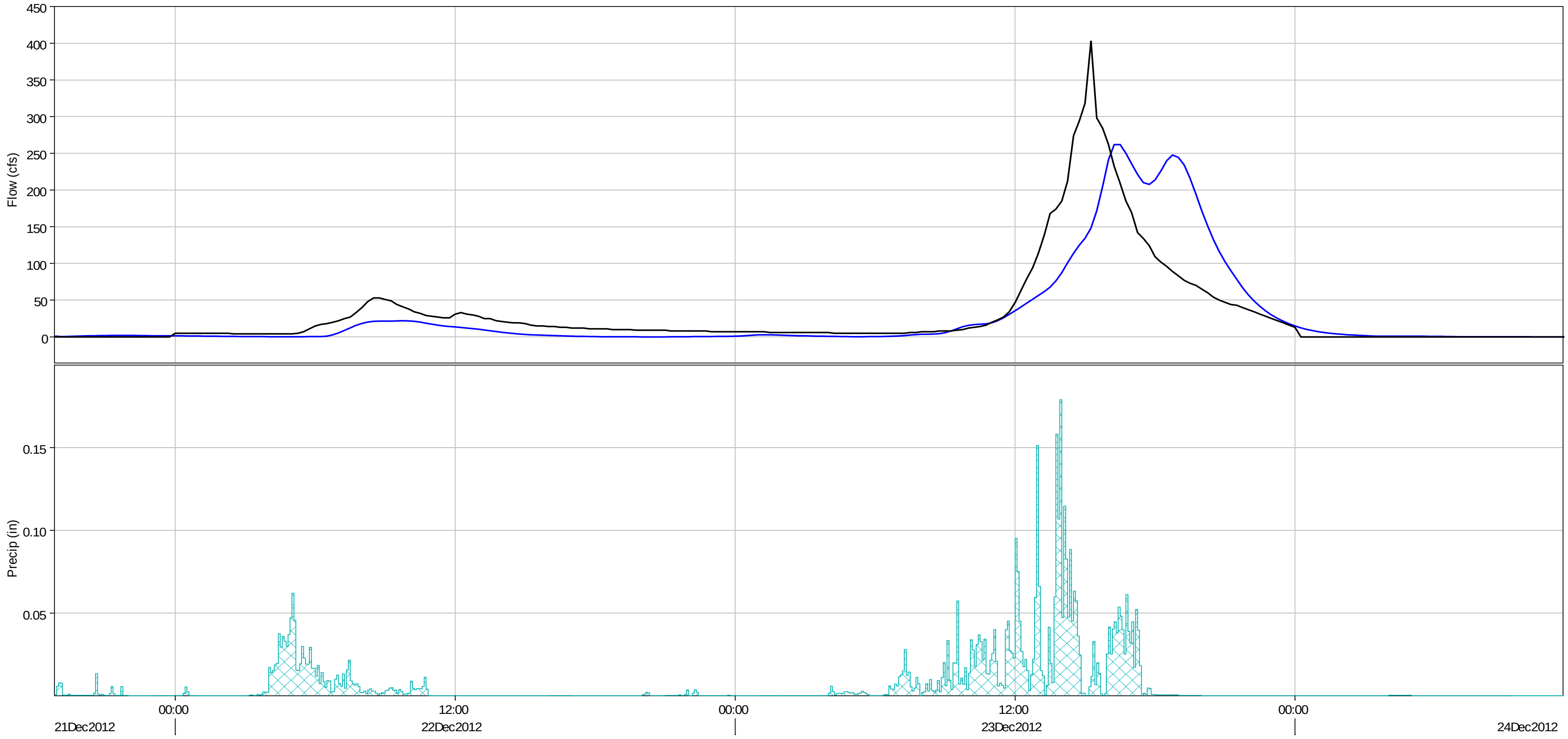
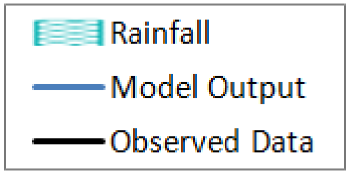


Figure 31: Alambique – December 2012

NOTE: *Culvert near gage clogged during storm. Observed flow data quality is poor at best, and determined from visual inspection. Rainfall data is also suspect.*



5. DESIGN STORM

5.1. PATTERN

Traditionally, the District has used a center-loaded 24-hour storm pattern based on rainfall statistics. This storm pattern is shown in Figure 32. However, a 72-hour storm pattern will also be used to account for the wetting behavior of Searsville Lake.

The storm of record for the entire county was in December 1955, and will be used as the basis for the 72-hr design storm. The storm pattern was modified by using precipitation frequency depths described in below. Depth durations of 1-hr, 2-hr, 3-hr, 6-hr, 12-hr, 24-hr, 48-hr and 72-hrs were used to ensure that within the 1955 pattern, each duration interval inside the design storm represented the statistically determined precipitation depths.

Rainfall depths are contingent upon mean annual precipitation (MAP) when using District rainfall equation, as explained in the next section. In lieu of creating a unique pattern for each sub-basin, the weighted-average MAP was determined for the entire watershed and used in the pattern modification for several reasons:

- The majority of the watershed is in the hills, and therefore does not have such a large variation in MAP compared with the valley.
- The differences in the patterns if each sub-basin was performed individually would be very slight, and from previous experience, not very sensitive.
- The design flow, regardless of rainfall depth and pattern, is calibrated to a gage FFA.

The aforementioned procedure was only done with 100-yr depths. The same pattern used for the 100-yr was adopted for the 10-yr design storm pattern for most of the same reasons listed above. The original 1955 storm pattern, as well as the modified storm pattern, is shown in Figure 33 and Figure 34.

5.2 RAINFALL DEPTH

NOAA-14 depths were not used to characterize the design storm. Previous hydrology studies using NOAA-14 rainfall depths yielded extremely high design flows, in many instances almost double the stream gage flood frequency analysis (FFA) flows. Attempts to balance the flows by modifying model parameters became unreasonable. Therefore, District rainfall depths were used.

The District's TDS regional equation is used to calculate the design rainfall depths. The District performed a statistical analysis on all forty rain gages within its jurisdiction to create the regression equation that can estimate precipitation for ungaged watersheds within this hydrometeorologic region.

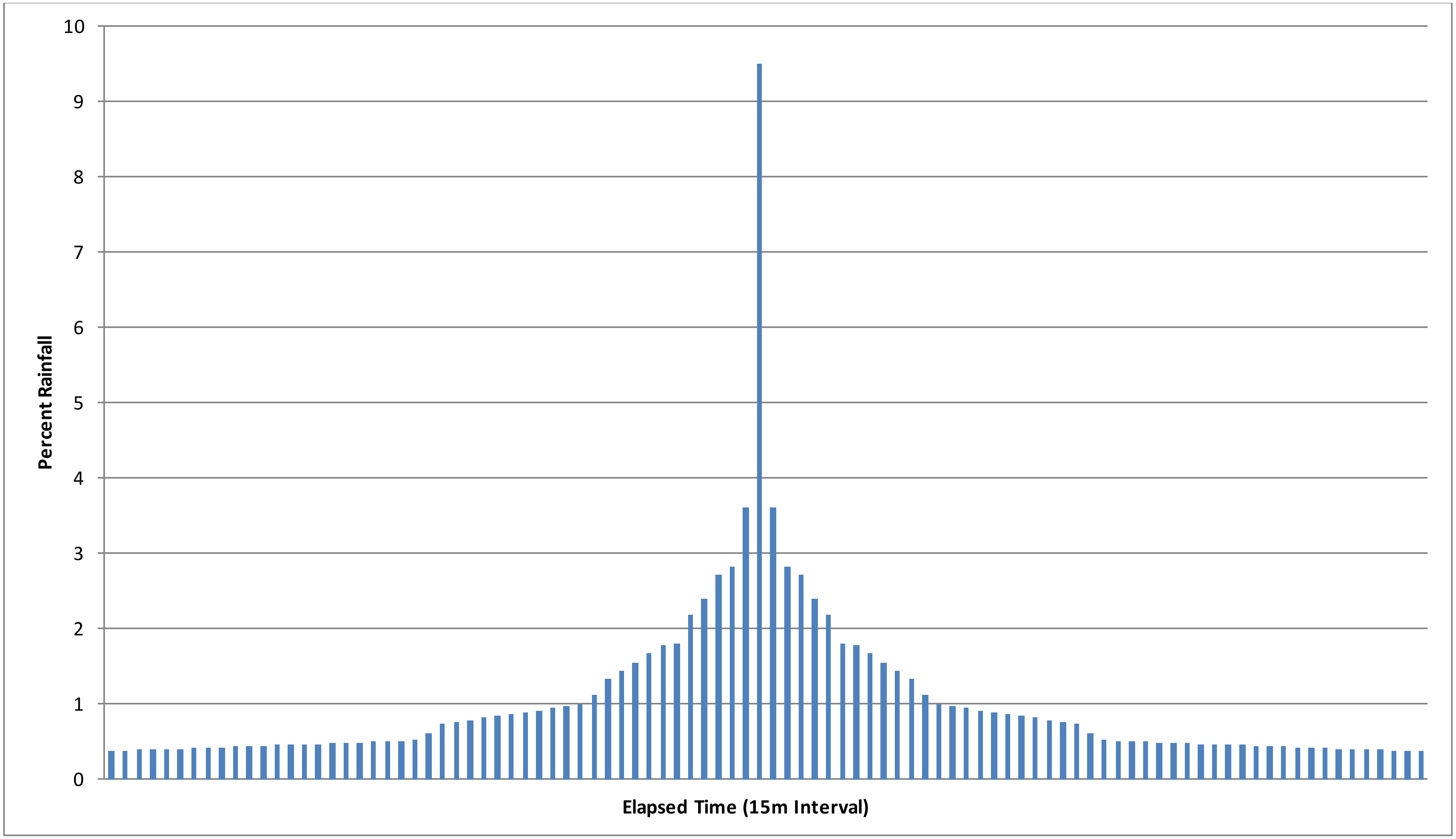


Figure 32: 24-hr Design Storm Pattern

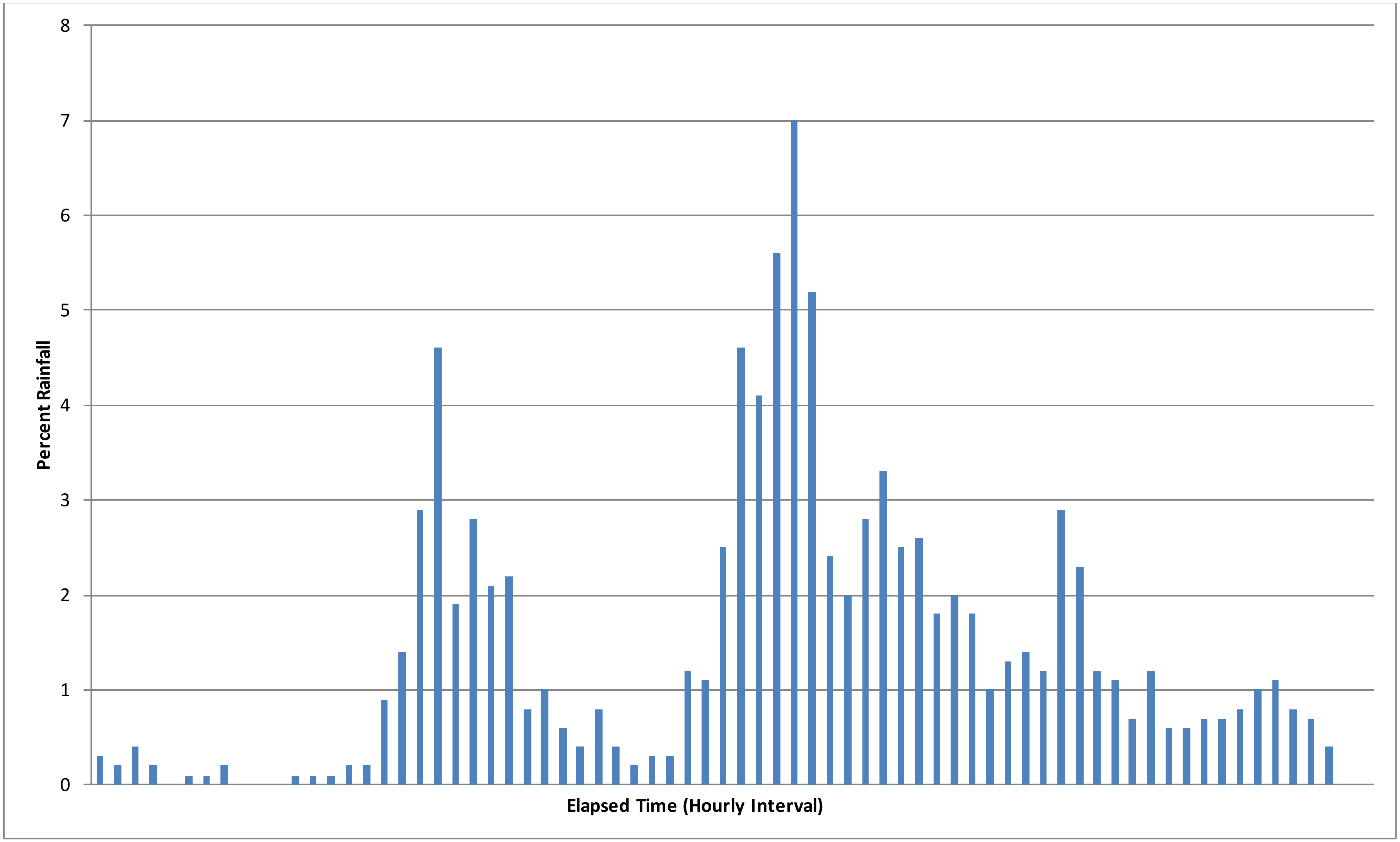


Figure 33: 1955 Storm Pattern

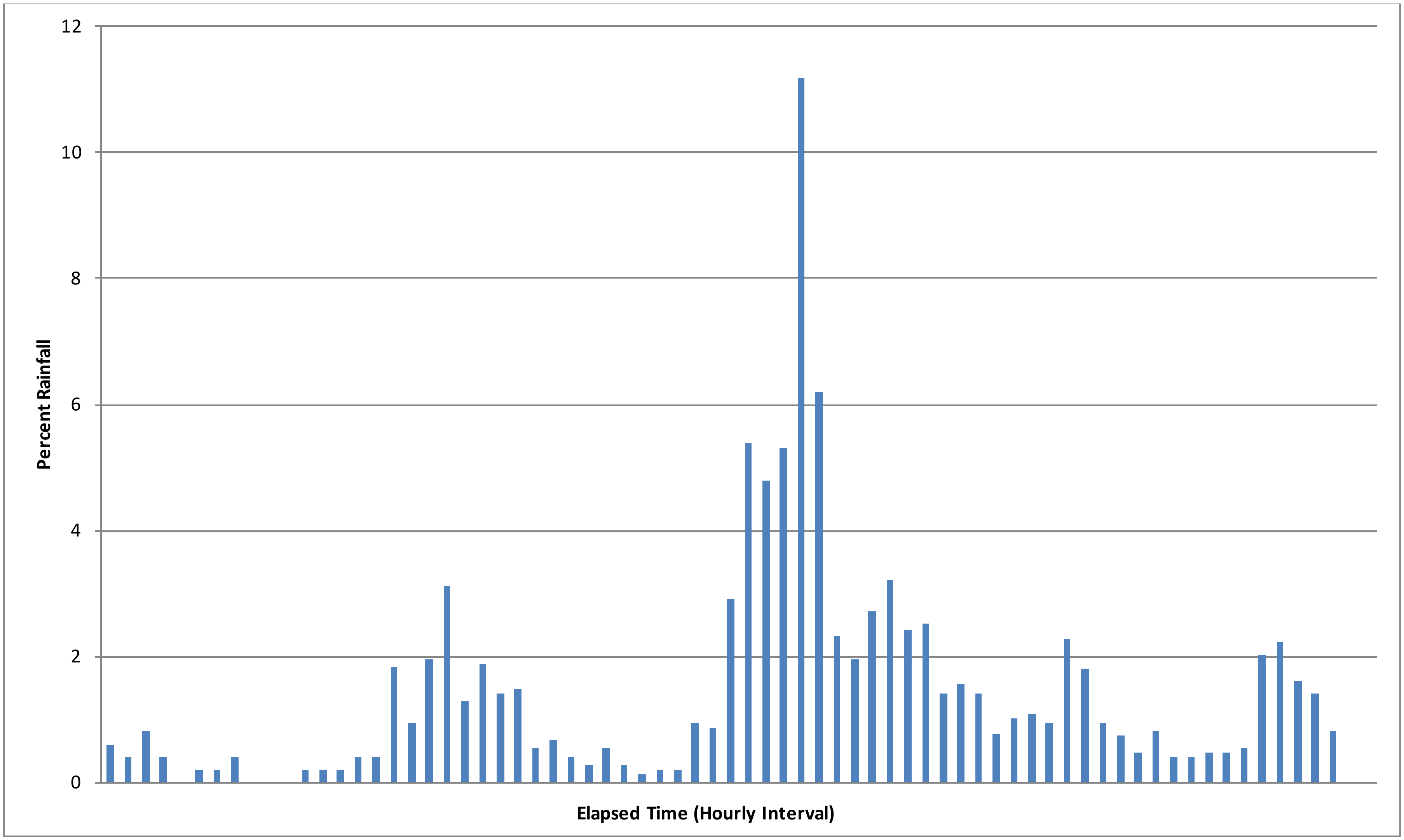


Figure 34: 72-hr Design Pattern

The total precipitation for a given storm duration and frequency can be determined from the following TDS equation published by the District[11].

$$P_{f,d} = A_{f,d} + B_{f,d} \times MAP$$

Where:

$P_{f,d}$ = Precipitation depth in inches for a given f, frequency (%) and d, duration (hours).
$A_{f,d}$ & $B_{f,d}$ = Regression constants and coefficients given in the table below
MAP = Mean annual precipitation, in inches, from SCVWD

Table 7: TDS Equation Constants

	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr	48-hr	72-hr
A (1%)	0.5074	0.5317	0.498	0.3228	0.2588	0.1102	0.3239	-0.0876
B (1%)	0.019	0.0389	0.0579	0.1082	0.1613	0.217	0.2751	0.3382
A (10%)	-	-	-	-	-	0.0028	-	-0.1569
B (10%)	-	-	-	-	-	0.1653	-	0.2552

Precipitation depth was calculated individually for each sub-basin in the hydrologic model using the TDS equation shown above due to the variation of MAP. TDS equations for the 10-year recurrence event were only used for the full 24-hr and 72-hr depths, as the other durations were not required since the pattern was already created using the 100-year event.

5.3 DEPTH AREA REDUCTION FACTOR (DARF)

When accounting for spatial variation in rainfall depth over a large watershed, DARFs are commonly used. As the study area increases in size, there is a decrease in rainfall depth. To properly account for the spatial variation, the depth-area reduction table 13.3 in HMR 59[12] was used. HMR 59 analyzed the largest recorded storms in California to produce the DARFs. Values between the discrete points in the table were interpolated linearly. For San Francisquito, all depths were multiplied by 92.1%, which represents the DARF for a watershed area of 44.95 square miles.

5.4 SEARSVILLE LAKE

To properly model the hydraulic effects of Searsville Lake, a 2D model was used to route flows from the upper lake to the dam spillway. Output from the hydrologic model was used as input to the hydraulic 2D model, and the resulting output used as dam outflow for the hydrologic model.

[11] SCVWD 2013. Precipitation Gage Data and Depth-Duration-Frequency Analysis. Revised from Saah et al, 2004
[12] NOAA. Hydrometeorological Report No. 59. Probable Maximum Precipitation for California, February 1999.

6. FLOOD FREQUENCY ANALYSIS (FFA)

6.1. DATA

The only stream gage with a significant historical record to perform a FFA is the USGS gage #11164500 at the Stanford golf course. This gage began measuring stream flow in 1932 and has since maintained a continuous length of record, except for a gap from 1942 to 1950. To date, there are 73 annual peak discharges over a period of 83 years.

Stream gage data was downloaded from the USGS National Water Information System[13] (NWIS). Analysis was performed using USGS PeakFQSA[14] software, which also includes an automatic low outlier test improved upon from the original Bulletin 17B, also known as 17C[15]. Gage analysis was performed using a weighted skew, with regional skews determined by USGS SIR 2010-5260[16], which followed the following equation:

$$Regional\ Skew = -0.62 + 1.3\ [\ 1 - \ e^{(-Mean\,Basin\,Elevation/6500)^2}\ ]$$

Input parameters are listed below in Table 8. Station skew was calculated by the PeakFQSA program and varied depending on the outlier selection.

Table 8: USGS Gage Regional Skew & Mean Square Error

Location	Average Basin Elev	Skew	Mean Square Error
USGS Gage 11164500	953’	-0.60	0.14

6.2 RESULTS

Analysis was performed with two separate low-outlier test methods. The first was the Multiple Grubbs-Beck Test (MGBT) method, which is the default 17C method. The second MGBT method calculated a low-outlier threshold of approximately 1,600cfs. To test sensitivity, a manual low-outlier threshold of 139cfs was used based on visual examination of the data set. Both methods produced similar 100-year flows. 100-yr flows for both methods can be seen in Table 9. Graphs can be seen below in Figure 35 for the MGBT and Figure 36 for the manual threshold. Final FFA results for the MGBT method are in Table 9.

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[13] http://nwis.waterdata.usgs.gov/nwis
[14] Tim Cohn, USGS. PeakFQSA Version 0.998. Flood Frequency Analysis with the Expected Moments Algorithm
[15] Recommended Revisions to Bulletin 17B. June 12, 2013. Subcommittee on Hydrology, Advisory Committee on Water Information. Hydrologic Frequency Analysis Work Group (HFAWG) Memorandum.
[16] Parrett, C., Veilleux, A., Stedinger, J.R., Barth, N.A., Knifong, D.L., and Ferris, J.C., 2011, Regional skew for California, and flood frequency for selected sites in the Sacramento–San Joaquin River Basin, based on data through water year 2006: U.S. Geological Survey Scientific Investigations Report 2010–5260, 94 p.

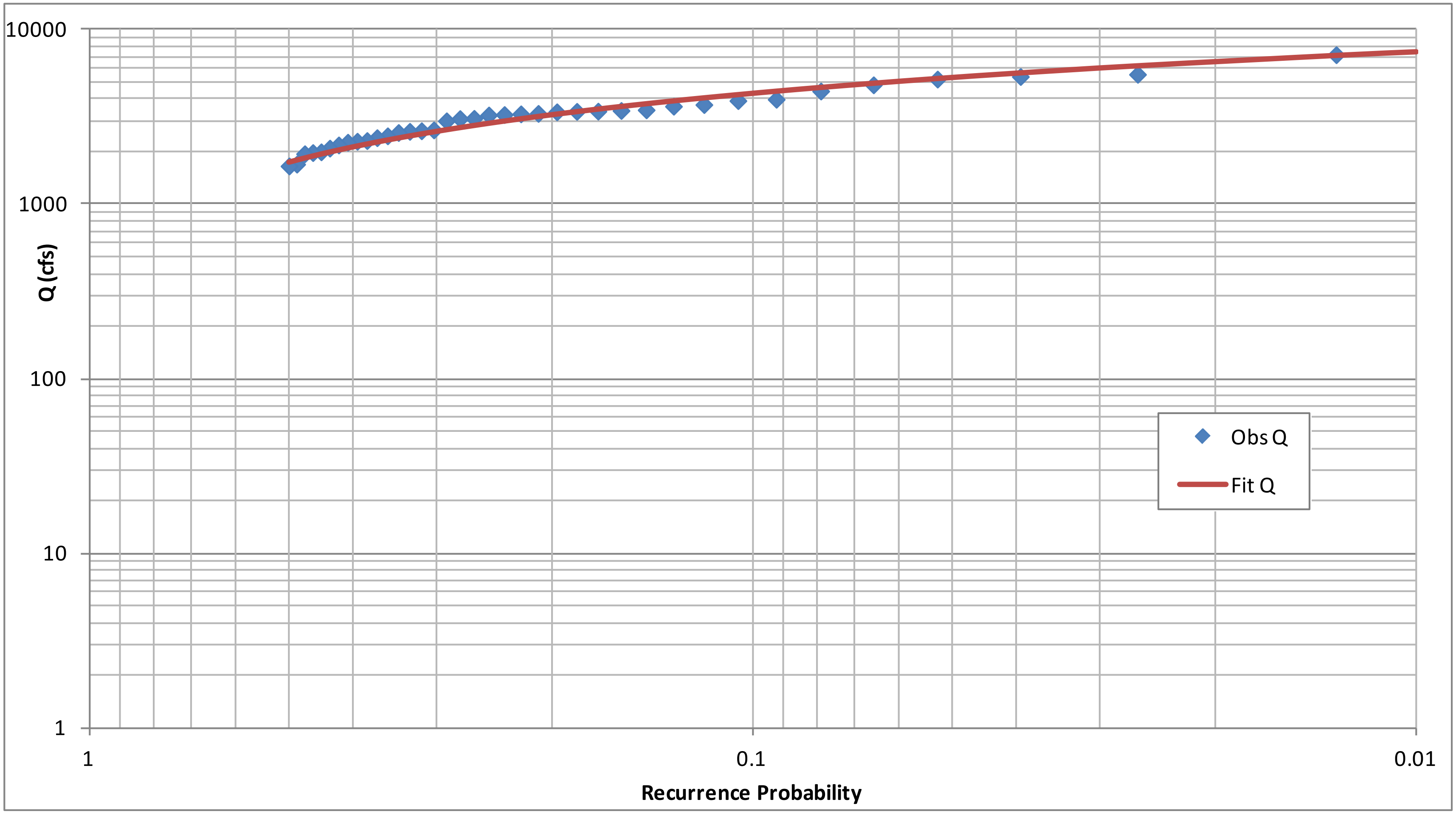


Figure 35: USGS Gage FFA Plot (MGBT)

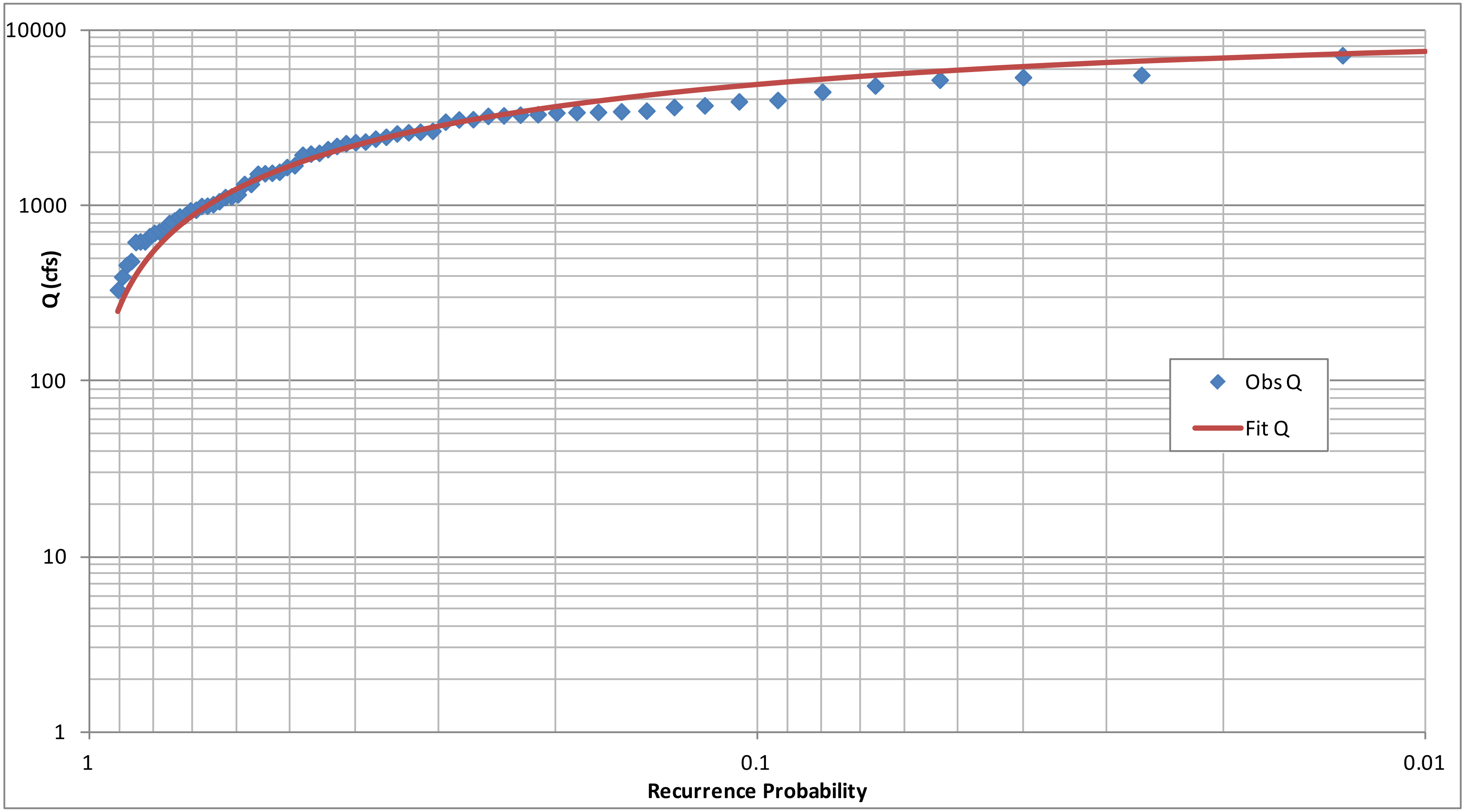


Figure 36: USGS Gage FFA Plot (139cfs Minimum Threshold)

Table 9: USGS Gage 11164500 FFA (MGBT)

Recurrence	Q Flow (cfs)
500yr	9,456cfs
200yr	8,382cfs
100yr	7,519cfs
50yr	6,612cfs
25yr	5,660cfs
10yr	4,330cfs
5yr	3,261cfs
2yr	1,734cfs

6.3 PREVIOUS INDEPENDENT ANALYSES

Two separate independent FFA studies were previously completed for the same gage. The first was a part of the Palo Alto Flood Basin Study by Shaaf and Wheeler in 2014[17]. The second was SIR 2010-5260, a study by the USGS in 2010 on all stream gages within the state of California that presents the most recent regional regression equations. Values vary slightly, due to additional data points, regional skew values, and low-outlier tests. However, all values are reasonably close. Table 10 below compares the different values.

Table 10: USGS Gage 100-yr FFA Comparisons

Study	Q100
Current Study (MGBT)	7,519cfs
Current Study (Manual Threshold)	7,547cfs
USGS SIR 2010-5260	7,690cfs
Shaaf & Wheeler PAFB	7,810cfs

6.4 SEARSVILLE DAM

The historical peak flows recorded by the USGS gage are influenced by the presence of Searsville Dam on the system. It is evident from recent large events that the lake and the dam provide a level of flood protection. However, given the dynamic change of the lake through sedimentation and the resulting topographic change upstream of the lake, it is not clear how the dam has affected the measured flows since the advent of the USGS gage.

[17] Schaaf & Wheeler. Palo Alto Flood Basin Hydrology. July 2014. Prepared for SCVWD.

The prevailing thought is that as time passed, the lake gradually filled up with sediment, reducing the storage, and thereby increasing runoff downstream. Therefore, it is expected that the annual peak flows measured at the USGS gage would be higher in the past if Searsville Lake and dam, in its current state, was present. This might make our current FFA slightly low given the current conditions. However, this theory has not been verified. To offset this possible uncertainty, the design flow should be set conservatively higher than the results of the FFA.

7. DESIGN FLOWS

7.1. DESIGN MODEL PARAMETERS

Two design storm durations were used to ensure that the most conservative effect of Searsville Lake was captured. Although the design model will be calibrated to FFA value at the USGS gage, other catch points upstream of the gage do not have an index point and might be affected by storm duration.

For the 24-hr design storm pattern, an AMC of 1.65 was used. For the 72-hr design storm pattern, an AMC of 1.4 was used. Time of concentration values were based on a Q100 flows based on USGS regional regression values for each sub-basin, similar to the method used during model calibration. Storage coefficient ratios were left at 0.5 for all sub-basins.

A secondary HEC-HMS basin geometry was created as a “no Searsville lake” option. This model contained a few extra routing reaches to account for the distance in the HEC-RAS 2D model. This basin geometry was used to determine Searsville inflow values, as the Searsville tributaries in the original geometry was disconnected to allow the routing to be performed in the 2D model.

7.2 RESULTS

Model results for both the 24-hr and 72-hr design storms are below. The higher flow value between the two storms will be used as the final design storm.

Table 11: SFC 100-yr Design Model Output

Location	HEC-HMS ID	Q100 (24-hr AMC 1.65)	Q100 (72-hr AMC 1.4)	Final Design Flows
Searsville Inflow	SFQ_E_Lake	4,087	4,261	4,261
Searsville Outflow	Searsville Gage	3,087	3,191	3,191
Bear Creek U/S SFC	SFQ_AA15_Junction	2,863	2,883	2,883
Los Trancos U/S SFC	SFQ_G6_Junction	1,508	1,520	1,520
SFC U/S Los Trancos	SFQ_F_Junction	6,375	6,465	6,465
USGS	SFW_H_USGS_Junction	7,775	7,860	7,860
Pope Chaucer	SFQ_M_Junction	8,312	8,338	8,338
US-101	SFQ_N_Junction	8,566	8,560	8,566

Table 12: SFC 10-yr Design Model Output

Location	HEC-HMS ID	Q10 (24-hr AMC 1.65)	Q10 (72-hr AMC 1.4)	Final Design Flows
Searsville Inflow	SFQ_E_Lake	2,373	2,360	2,373
Searsville Outflow	Searsville Gage	1,648	1,731	1,731
Bear Creek U/S SFC	SFQ_AA15_Junction	1,768	1,784	1,784
Los Trancos U/S SFC	SFQ_G6_Junction	920	934	934
SFC U/S Los Trancos	SFQ_F_Junction	3,550	3,670	3,670
USGS	SFW_H_USGS_Junction	4,341	4,459	4,459
Pope Chaucer	SFQ_M_Junction	4,707	4,785	4,785
US-101	SFQ_N_Junction	4,868	4,916	4,916

7.3 FINAL FLOWS

Using the computed 10-yr and 100-yr design flows, interpolation and extrapolation was performed using Log-Pearson Type III methodology described in Bulletin 17B [18]. The general distribution fit is defined by the following equation:

$$Log\, Q = \bar{X} + K \times S$$

In this case, the flow variable Q is known for the 1% and 10% frequencies, as well as the constant factor K that is obtained from Appendix 3 of Bulletin 17B given a general skew coefficient G, which is determined to be -0.60. That leaves X-bar and S as two unknowns that can be solved.

Final design flows, along with associated K, S, and X-bar values can be seen in Table 13.

[18] Guidelines for Determining Flood Flow Frequency – Bulletin #17B of the Hydrology Subcommittee. Interagency Advisory Committee on Water Data. Revised 1981. Editorial Corrections March 1982. USGS.

Table 13: Final Design Flows

	Recurrence Interval								Calculated Values	
Location	2.33-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	200-Yr	500-Yr	S	X-bar
Searsville Inflow	1,080	1,780	2,380	3,140	3,880	4,270	4,760	5,420	0.36963	2.93164
Searsville Outflow	760	1,280	1,740	2,320	2,900	3,200	3,580	4,100	0.38623	2.77471
Bear Creek U/S SFC	940	1,410	1,790	2,250	2,670	2,890	3,160	3,510	0.30309	2.88760
Los Trancos U/S SFC	490	740	940	1,180	1,410	1,520	1,670	1,860	0.30752	2.60124
SFC U/S Los Trancos	1,710	2,770	3,670	4,810	5,910	6,470	7,190	8,150	0.35755	3.13551
USGS	2,080	3,370	4,460	5,850	7,180	7,860	8,740	9,910	0.35796	3.21959
Pope Chaucer	2,260	3,630	4,790	6,240	7,630	8,340	9,250	10,470	0.35068	3.25897
US-101	2,330	3,730	4,920	6,410	7,840	8,570	9,510	10,750	0.35066	3.27072
K-Value	0.27047	0.85718	1.20028	1.5283	1.77716	1.888029	2.01644	2.16884		

8. FUTURE CONDITIONS

8.1. WATERSHED URBANIZATION

In the hills, much of the area is open space preserve and protected from development. In the upper valley, by Searsville Lake, there is very light urbanization on mostly rural tracts of land. In the lower valley, Palo Alto and Menlo Park are essentially fully built out.

Given this information, it is not likely that imperviousness, a measure of urbanization, will change considerably in the next fifty or so years.

8.2. SEARSVILLE DAM

8.2.1. EXISTING CONDITION

Currently the dam provides very little storage in the reservoir proper due to sedimentation. However, there is a definite observed attenuation[19] from historical storms and modeling observations seem to indicate two main factors causing attenuation upstream of the lake:

- For the tributaries feeding into Searsville Lake, the channel capacity is very limited. There is significant usage of floodplains by these tributaries once the low flow channel is exceeded.
- Two constrictions from roadway crossings exist that divide the area upstream of the reservoir. The first is Portola Road crossing Alambique Creek. The second is a private road that spurs off Lakeshore Drive, which is a part of the Stanford Jasper Ridge preserve.

The combination of floodplain usage and roadway constrictions creates artificial detention ponds upstream of Searsville Lake, causing the observed attenuation.

8.2.2. FUTURE CONDITION

Future Searsville operation is uncertain as Stanford is currently in litigation. However, the most recent study[20] put forth by Stanford recommend two options:

- Let the dam silt in and build a fish ladder passage.
- Create an orifice at the dam base and excavate the sediment inside the lake.

It is unlikely that Stanford will move forth with any proposed action that will exacerbate flooding downstream of the dam. To ensure that future conditions will not change the design flow, the 1% design storm for both the 24-hr and 72-hr was run with a starting water surface at the invert of the lowest gate in the 2D model to simulate a completely full dam. Results were compared to the existing run and there was no difference in peak flow or timing.

[19] Xu, Jack. SCVWD. Technical Memorandum - Effect of Searsville Lake on Large Storm Events. March 25, 2015.
[20] Searsville Alternatives Study, Steering Committee Recommendations. Stanford University. April 2015.

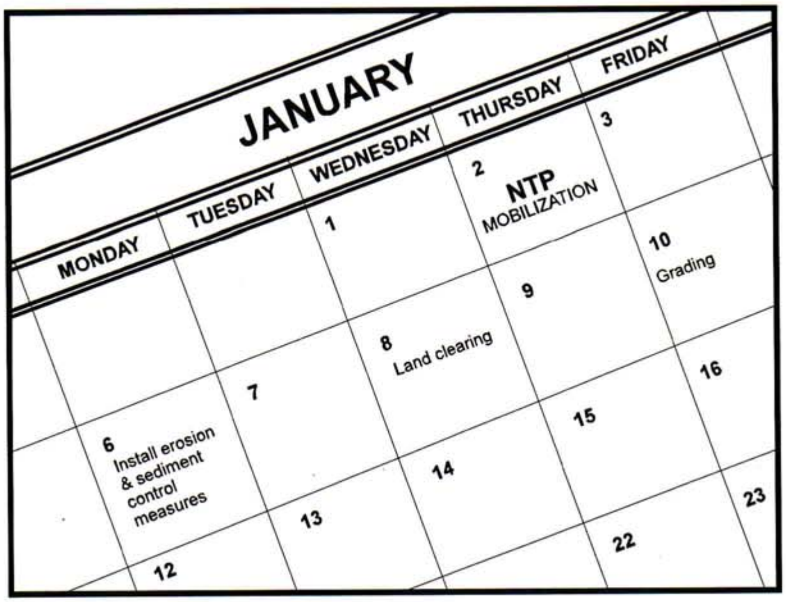
Attachment N

Notice of Termination

Attachment O

BMPs Selected for the Project
CASQA BMP Details

Scheduling EC-1



Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. 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.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.

- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

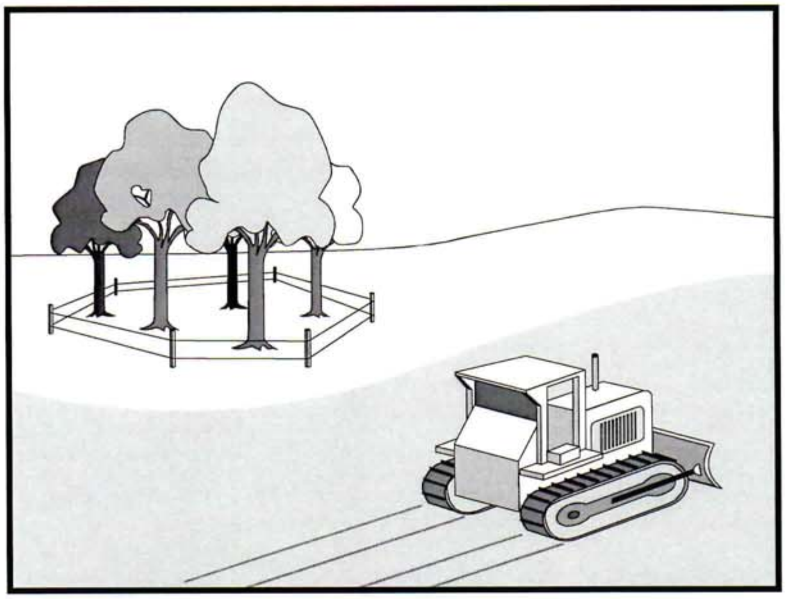
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Preservation Of Existing Vegetation EC-2



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

Limitations

- Requires forward planning by the owner/developer,

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contractor, and design staff.

- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.

- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

Timing

- Provide for preservation of existing vegetation 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.

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.

  - Orange colored plastic mesh fencing works well.

  - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.

- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.

- Consider the impact of grade changes to existing vegetation and the root zone.

- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.

- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of $10,000 per tree.

Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar, and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization
  - Fertilize stressed or damaged broadleaf trees to aid recovery.
  - Fertilize trees in the late fall or early spring.

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.

- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

References

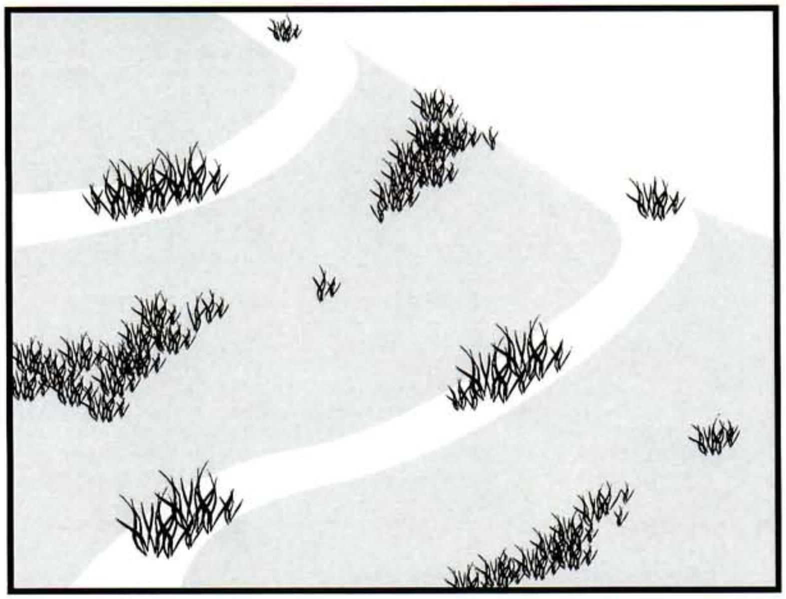
County of Sacramento Tree Preservation Ordinance, September 1981.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydroseeding EC-4



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

EC-16 Non-Vegetative Stabilization

Description and Purpose

Hydroseeding typically consists of applying a mixture of a hydraulic mulch, seed, fertilizer, and stabilizing emulsion with a hydraulic mulcher, to temporarily protect exposed soils from erosion by water and wind. Hydraulic seeding, or hydroseeding, is simply the method by which temporary or permanent seed is applied to the soil surface.

Suitable Applications

Hydroseeding is suitable for disturbed areas requiring temporary protection until permanent stabilization is established, for disturbed areas that will be re-disturbed following an extended period of inactivity, or to apply permanent stabilization measures. Hydroseeding without mulch or other cover (e.g. EC-7, Erosion Control Blanket) is not a stand-alone erosion control BMP and should be combined with additional measures until vegetation establishment.

Typical applications for hydroseeding include:

- Disturbed soil/graded areas where permanent stabilization or continued earthwork is not anticipated prior to seed germination.
- Cleared and graded areas exposed to seasonal rains or temporary irrigation.
- Areas not subject to heavy wear by construction equipment or high traffic.

Limitations

- Availability of hydroseeding equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Hydraulic seed should be applied with hydraulic mulch or a stand-alone hydroseed application should be followed by one of the following:
  - Straw mulch (see Straw Mulch EC-6)
  - Rolled erosion control products (see Geotextiles and Mats EC-7)
  - Application of Compost Blanket (see Compost Blanket EC-14)

  Hydraulic seed may be used alone only on small flat surfaces when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control.
- Hydraulic seed without mulch does not provide immediate erosion control.
- Temporary seeding may not be appropriate for steep slopes (i.e., slopes readily prone to rill erosion or without sufficient topsoil).
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation may not be appropriate for short term inactivity (i.e. less than 3-6 months).

Implementation

In order to select appropriate hydraulic seed mixtures, an evaluation of site conditions should be performed with respect to:

- Soil conditions
- Site topography and exposure (sun/wind)
- Season and climate
- Vegetation types
- Maintenance requirements
- Sensitive adjacent areas
- Water availability
- Plans for permanent vegetation

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS) is an excellent source of information on appropriate seed mixes.

The following steps should be followed for implementation:

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying (See EC-15, Soil Preparation) the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.

- Avoid use of hydraulic seed in areas where the BMP would be incompatible with future earthwork activities.
- Hydraulic seed can be applied using a multiple step or one step process.
  - In a multiple step process, hydraulic seed is applied first, followed by mulch or a Rolled Erosion Control Product (RECP).
  - In the one step process, hydraulic seed is applied with hydraulic mulch in a hydraulic matrix. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate should be increased to compensate for all seeds not having direct contact with the soil.
- All hydraulically seeded areas should have mulch, or alternate erosion control cover to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds should be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag should be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container should be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed should be pellet inoculated. Inoculant sources should be species specific and should be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer should conform to the requirements of the California Food and Agricultural Code, which can be found at http://www.leginfo.ca.gov/.html/fac_table_of_contents.html. Fertilizer should be pelleted or granular form.
- Follow up applications should be made as needed to cover areas of poor coverage or germination/vegetation establishment and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Costs

Average cost for installation and maintenance may vary from as low as $1,900 per acre for flat slopes and stable soils, to $4,000 per acre for moderate to steep slopes and/or erosive soils. Cost of seed mixtures vary based on types of required vegetation.

BMP	Installed Cost per Acre
Hydraulic Seed	$1,900-$4,000

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.

- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.

- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.

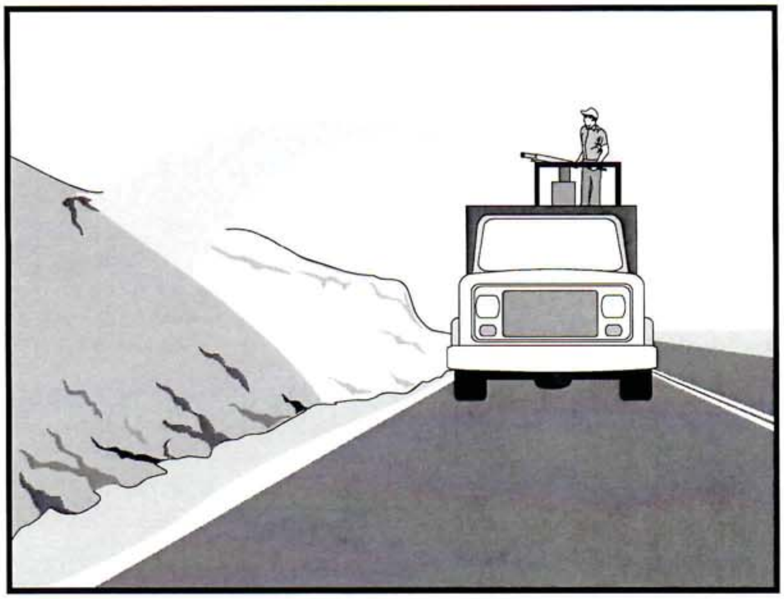
- Irrigation systems should be inspected for complete coverage and adjusted as needed to maintain complete coverage.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-5 Soil Binders

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

EC-14 Compost Blanket

Description and Purpose

Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or crimper, or anchoring it with a tackifier or stabilizing emulsion. Straw mulch protects the soil surface from the impact of rain drops, preventing soil particles from becoming dislodged.

Suitable Applications

Straw mulch is suitable for disturbed areas requiring temporary protection until permanent stabilization is established. Straw mulch can be specified for the following applications:

- As a stand-alone BMP on disturbed areas until soils can be prepared for permanent vegetation. The longevity of straw mulch is typically less than six months.
- Applied in combination with temporary seeding strategies
- Applied in combination with permanent seeding strategies to enhance plant establishment and final soil stabilization
- Applied around containerized plantings to control erosion until the plants become established to provide permanent stabilization

Limitations

- Availability of straw and straw blowing equipment may be limited just prior to the rainy season and prior to storms due to high demand.

- There is a potential for introduction of weed seed and unwanted plant material if weed-free agricultural straw is not specified.
- Straw mulch applied by hand is more time intensive and potentially costly.
- Wind may limit application of straw and blow straw into undesired locations.
- May have to be removed prior to permanent seeding or prior to further earthwork.
- "Punching" of straw does not work in sandy soils, necessitating the use of tackifiers.
- Potential fugitive dust control issues associated with straw applications can occur. Application of a stabilizing emulsion or a water stream at the same time straw is being blown can reduce this problem.
- Use of plastic netting should be avoided in areas where wildlife may be entrapped and may be prohibited for projects in certain areas with sensitive wildlife species, especially reptiles and amphibians.

Implementation

- Straw should be derived from weed-free wheat, rice, or barley. Where required by the plans, specifications, permits, or environmental documents, native grass straw should be used.
- Use tackifier to anchor straw mulch to the soil on slopes.
- Crimping, punch roller-type rollers, or track walking may also be used to incorporate straw mulch into the soil on slopes. Track walking can be used where other methods are impractical.
- Avoid placing straw onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.
- Straw mulch with tackifier should not be applied during or immediately before rainfall.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Application Procedures

- When using a tackifier to anchor the straw mulch, roughen embankment or fill areas by rolling with a crimping or punching-type roller or by track walking before placing the straw mulch. Track walking should only be used where rolling is impractical.
- Apply straw at a rate of between 3,000 and 4,000 lb/acre, either by machine or by hand distribution and provide 100% ground cover. A lighter application is used for flat surfaces and a heavier application is used for slopes.
- Evenly distribute straw mulch on the soil surface.
- Anchoring straw mulch to the soil surface by "punching" it into the soil mechanically (incorporating) can be used in lieu of a tackifier.

- Methods for holding the straw mulch in place depend upon the slope steepness, accessibility, soil conditions, and longevity.
  - A tackifier acts to glue the straw fibers together and to the soil surface. The tackifier should be selected based on longevity and ability to hold the fibers in place. A tackifier is typically applied at a rate of 125 lb/acre. In windy conditions, the rates are typically 180 lb/acre.
  - On very small areas, a spade or shovel can be used to punch in straw mulch.
  - On slopes with soils that are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be "punched" into the ground using a knife blade roller or a straight bladed coulter, known commercially as a "crimper."

Costs

Average annual cost for installation and maintenance is included in the table below. Application by hand is more time intensive and potentially more costly.

BMP	Unit Cost per Acre
Straw mulch, crimped or punched	$2,458-$5,375
Straw mulch with tackifier	$1,823-$4,802

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- The key consideration in inspection and maintenance is that the straw needs to last long enough to achieve erosion control objectives. Straw mulch as a stand-alone BMP is temporary and is not suited for long-term erosion control.
- Maintain an unbroken, temporary mulched ground cover while disturbed soil areas are inactive. Repair any damaged ground cover and re-mulch exposed areas.
- Reapplication of straw mulch and tackifier may be required to maintain effective soil stabilization over disturbed areas and slopes.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Controlling Erosion of Construction Sites, Agricultural Information Bulletin #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

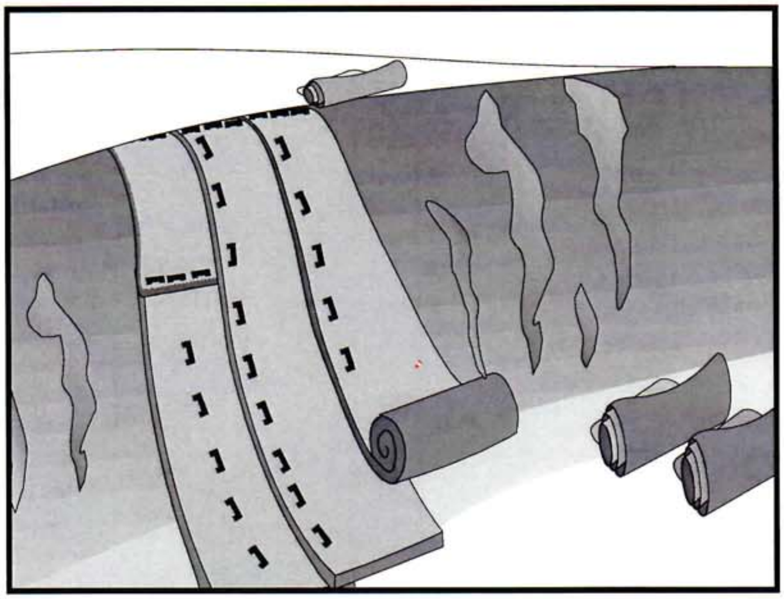
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Soil Erosion by Water, Agricultural Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



Categories

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WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

Description and Purpose

Mattings, or Rolled Erosion Control Products (RECPs), can be made of natural or synthetic materials or a combination of the two. RECPs are used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface. Additionally, RECPs may be used to stabilize soils until vegetation is established or to reinforce non-woody surface vegetation.

Suitable Applications

RECPs are typically applied on slopes where erosion hazard is high and vegetation will be slow to establish. Mattings are also used on stream banks, swales and other drainage channels where moving water at velocities between 3 ft/s and 6 ft/s are likely to cause scour and wash out new vegetation, and in areas where the soil surface is disturbed and where existing vegetation has been removed. RECPs may also be used when seeding cannot occur (e.g., late season construction and/or the arrival of an early rain season). RECPs should be considered when the soils are fine grained and potentially erosive. RECPs should be considered in the following situations.

- Steep slopes, generally steeper than 3:1 (H:V)
- Slopes where the erosion potential is high
- Slopes and disturbed soils where mulch must be anchored
- Disturbed areas where plants are slow to develop

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- Channels with flows exceeding 3.3 ft/s
- Channels to be vegetated
- Stockpiles
- Slopes adjacent to water bodies

Limitations

- RECP installed costs are generally higher than other erosion control BMPs, limiting their use to areas where other BMPs are ineffective (e.g. channels, steep slopes).
- RECPs may delay seed germination, due to reduction in soil temperature.
- RECPs are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (since staples and netting can catch in mowers). If a staple or pin cannot be driven into the soil because the underlying soil is too hard or rocky, then an alternative BMP should be selected.
- If used for temporary erosion control, RECPs should be removed and disposed of prior to application of permanent soil stabilization measures.
- The use of plastic should be limited to covering stockpiles or very small graded areas for short periods of time (such as through one imminent storm event) until more environmentally friendly measures, such as seeding and mulching, may be installed.
    - Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
    - Plastic sheeting results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
- RECPs may have limitations based on soil type, slope gradient, or channel flow rate; consult the manufacturer for proper selection.
- Not suitable for areas that have foot traffic (tripping hazard) – e.g., pad areas around buildings under construction.
- RECPs that incorporate a plastic netting (e.g. straw blanket typically uses a plastic netting to hold the straw in place) may not be suitable near known wildlife habitat. Wildlife can become trapped in the plastic netting.
- RECPs may have limitations in extremely windy climates. However, when RECPs are properly trenched at the top and bottom and stapled in accordance with the manufacturer's recommendations, problems with wind can be minimized.

Implementation

Material Selection

- Natural RECPs have been found to be effective where re-vegetation will be provided by re-seeding. The choice of material should be based on the size of area, side slopes, surface conditions such as hardness, moisture, weed growth, and availability of materials.

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

- The following natural and synthetic RECPs are commonly used:

Geotextiles

- Material can be a woven or a non-woven polypropylene fabric with minimum thickness of 0.06 in., minimum width of 12 ft and should have minimum tensile strength of 150 lbs (warp), 80 lbs (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric should be approximately 0.07 sec^{-1} in conformance with the requirements in ASTM Designation: D4491. The fabric should have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets must be secured in place with wire staples or sandbags and by keying into tops of slopes to prevent infiltration of surface waters under geotextile. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Geotextiles may be reused if they are suitable for the use intended.

Plastic Covers

- Generally plastic sheeting should only be used as stockpile covering or for very small graded areas for short periods of time (such as through one imminent storm event). If plastic sheeting must be used, choose a plastic that will withstand photo degradation.

- Plastic sheeting should have a minimum thickness of 6 mils, and must be keyed in at the top of slope (when used as a temporary slope protection) and firmly held in place with sandbags or other weights placed no more than 10 ft apart. Seams are typically taped or weighted down their entire length, and there should be at least a 12 in. to 24 in. overlap of all seams. Edges should be embedded a minimum of 6 in. in soil (when used as a temporary slope protection).

- All sheeting must be inspected periodically after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures must be repaired immediately. If washout or breakages occur, the material should be re-installed after repairing the damage to the slope.

Erosion Control Blankets/Mats

- Biodegradable RECPs are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials. In order for an RECP to be considered 100% biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable. See typical installation details at the end of this fact sheet.

- **Jute** is a natural fiber that is made into a yarn that is loosely woven into a biodegradable mesh. The performance of jute as a stand-alone RECP is low. Most other RECPs outperform jute as a temporary erosion control product and therefore jute is not commonly used. It is designed to be used in conjunction with vegetation. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Excelsior** (curled wood fiber) blanket material should consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 6 in. or longer. The excelsior blanket should be of consistent thickness. The wood fiber must be evenly distributed over the entire area of the blanket. The top surface of the blanket should be covered with a photodegradable extruded plastic mesh. The blanket should be smolder resistant without the use of chemical additives and should be non-toxic and non-injurious to plant and animal life. Excelsior blankets should be furnished in rolled strips, a minimum of 48 in. wide, and should have an average weight of 0.8 lb/yd^2, ±10 percent, at the time of manufacture. Excelsior blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Straw blanket** should be machine produced mats of straw with a lightweight biodegradable netting top layer. The straw should be attached to the netting with biodegradable thread or glue strips. The straw blanket should be of consistent thickness. The straw should be evenly distributed over the entire area of the blanket. Straw blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Wood fiber blanket** is composed of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured to the ground with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Coconut fiber blanket** should be a machine produced mat of 100 percent coconut fiber with biodegradable netting on the top and bottom. The coconut fiber should be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket should be of consistent thickness. The coconut fiber should be evenly distributed over the entire area of the blanket. Coconut fiber blanket should be furnished in rolled strips with a minimum of 6.5 ft wide, a minimum of 80 ft. long and a minimum of 0.5 lb/yd^2. Coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- **Coconut fiber mesh** is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Straw coconut fiber blanket** should be machine produced mats of 70 percent straw and 30 percent coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber should be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket should be of consistent thickness. The straw and coconut fiber should be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket should be furnished in rolled strips a minimum of 6.5 ft wide, a minimum of 80 ft long and a minimum of 0.5 lb/yd^2. Straw coconut fiber blankets must be secured in place with wire staples. Staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.

- Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well.

  - **Plastic netting** is a lightweight biaxially oriented netting designed for securing loose mulches like straw or paper to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Plastic mesh** is an open weave geotextile that is composed of an extruded synthetic fiber woven into a mesh with an opening size of less than ¼ in. It is used with re-vegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which must be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Synthetic fiber with netting** is a mat that is composed of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be re-vegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Bonded synthetic fibers** consist of a three dimensional geomatrix nylon (or other synthetic) matting. Typically it has more than 90 percent open area, which facilitates root growth. It's tough root reinforcing system anchors vegetation and protects against hydraulic lift and shear forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Combination synthetic and biodegradable RECPs** consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high strength continuous filament geomatrix or net stitched to the bottom. The material is designed to enhance re-vegetation. The material is furnished in rolled strips, which must be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

Site Preparation

- Proper soil preparation is essential to ensure complete contact of the RECP with the soil. Soil Roughening is not recommended in areas where RECPs will be installed.
- Grade and shape the area of installation.
- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.
- Prepare seedbed by loosening 2 to 3 in. of topsoil.

Seeding/Planting

Seed the area before blanket installation for erosion control and re-vegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all areas disturbed during blanket installation must be re-seeded. Where soil filling is specified for turf reinforcement mats (TRMs), seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.

Check Slots

Check slots shall be installed as required by the manufacturer.

Laying and Securing Matting

- Before laying the matting, all check slots should be installed and the seedbed should be friable, made free from clods, rocks, and roots. The surface should be compacted and finished according to the requirements of the manufacturer's recommendations.
- Mechanical or manual lay down equipment should be capable of handling full rolls of fabric and laying the fabric smoothly without wrinkles or folds. The equipment should meet the fabric manufacturer's recommendations or equivalent standards.

Anchoring

- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Wire staples should be made of minimum 11 gauge steel wire and should be U-shaped with 8 in. legs and 2 in. crown.
- Metal stake pins should be 0.188 in. diameter steel with a 1.5 in. steel washer at the head of the pin, and 8 in. in length.
- Wire staples and metal stakes should be driven flush to the soil surface.

Installation on Slopes

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 6 in. deep by 6 in. wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket down slope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 2 to 3 in. and staple every 3 ft (or greater, per manufacturer's specifications).
- When blankets must be spliced, place blankets end over end (shingle style) with 6 in. overlap. Staple through overlapped area, approximately 12 in. apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples should be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (H:V) to 2:1 (H:V), require a minimum of 2 staples/yd^2. Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 1 ½ staples/yd^2. Check manufacturer's specifications to determine if a higher density staple pattern is required.

Installation in Channels

Installation should be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Dig initial anchor trench 12 in. deep and 6 in. wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 in. deep and 6 in. wide across the channel at 25 to 30 ft intervals along the channels.
- Cut longitudinal channel anchor trenches 4 in. deep and 4 in. wide along each side of the installation to bury edges of matting, whenever possible extend matting 2 to 3 in. above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12 in. intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 in.
- Secure these initial ends of mats with anchors at 12 in. intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 3 in. overlap.

- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12 in. intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for non-critical installations: Place two rows of anchors on 6 in. centers at 25 to 30 ft. intervals in lieu of excavated check slots.
- Staple shingled lap spliced ends a minimum of 12 in. apart on 12 in. intervals.
- Place edges of outside mats in previously excavated longitudinal slots; anchor using prescribed staple pattern, backfill, and compact soil.
- Anchor, fill, and compact upstream end of mat in a 12 in. by 6 in. terminal trench.
- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement mat (TRM))

Installation should be in accordance with the manufacturer's recommendations. Typical installation guidelines are as follows:

- After seeding, spread and lightly rake ½-3/4 inches of fine topsoil into the TRM apertures to completely fill TRM thickness. Use backside of rake or other flat implement.
- Alternatively, if allowed by product specifications, spread topsoil using lightweight loader, backhoe, or other power equipment. Avoid sharp turns with equipment.
- Always consult the manufacturer's recommendations for installation.
- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes, or brooms for fine grading and touch up.
- Smooth out soil filling just exposing top netting of mat.

Temporary Soil Stabilization Removal

- Temporary soil stabilization removed from the site of the work must be disposed of if necessary.

Costs

Installed costs can be relatively high compared to other BMPs. Approximate costs for installed materials are shown below:

Rolled Erosion Control Products		Installed Cost per Acre (2000)[1]	Estimated Cost per Acre (2009)[2]
Biodegradable	Jute Mesh	$6,000-$7,000	$6,600-$7,700
	Curled Wood Fiber	$8,000-$10,500	$8,800-$11,050
	Straw	$8,000-$10,500	$8,800-$11,050
	Wood Fiber	$8,000-$10,500	$8,800-$11,050
	Coconut Fiber	$13,000-$14,000	$14,300-$15,400
	Coconut Fiber Mesh	$30,000-$33,000	$33,000-$36,300
	Straw Coconut Fiber	$10,000-$12,000	$11,000-$13,200
Non-Biodegradable	Plastic Netting	$2,000-$2,200	$2,200-$2,220
	Plastic Mesh	$3,000-$3,500	$3,300-$3,850
	Synthetic Fiber with Netting	$34,000-$40,000	$37,400-$44,000
	Bonded Synthetic Fibers	$45,000-$55,000	$49,500-$60,500
	Combination with Biodegradable	$30,000-$36,000	$33,000-$39,600

1. Source: Erosion Control Pilot Study Report, Caltrans, June 2000.

2. 2009 costs reflect a 10% escalation over year 2000 costs. Escalation based on informal survey of industry trends. Note: Expected cost increase is offset by competitive economic conditions.

Inspection and Maintenance

- RECPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.
- Make sure matting is uniformly in contact with the soil.
- Check that all the lap joints are secure.
- Check that staples are flush with the ground.

References

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Erosion Control Pilot Study Report, State of California Department of Transportation (Caltrans), June 2000.

Guides for Erosion and Sediment Controls in California, USDA Soils Conservation Service, January 1991.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

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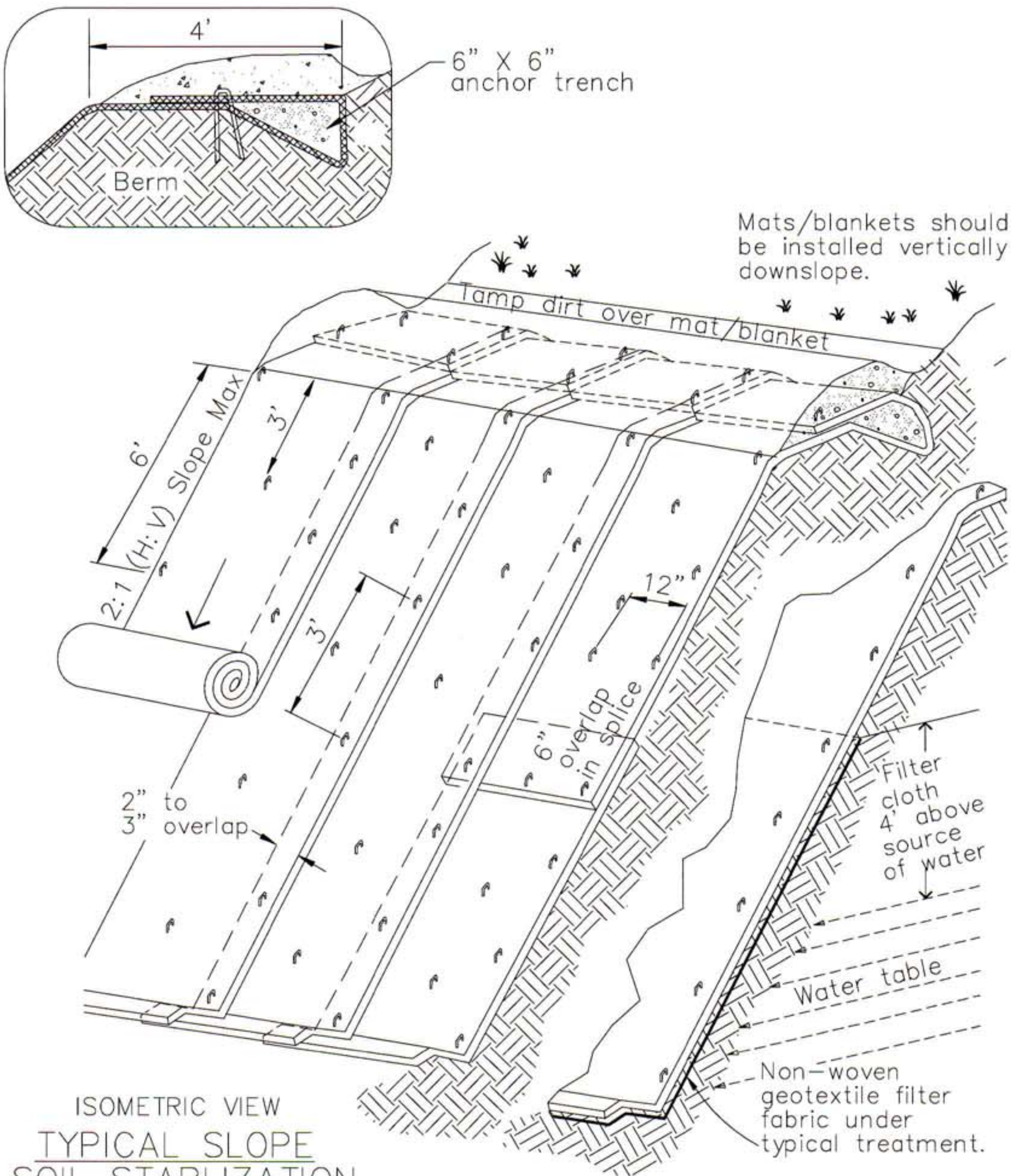


ISOMETRIC VIEW

TYPICAL SLOPE SOIL STABLIZATION

NTS

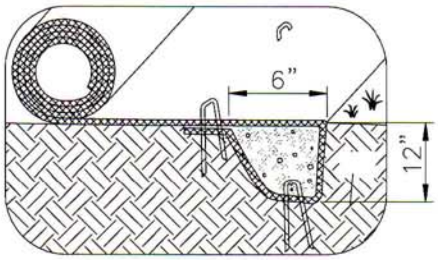
WET SLOPE LINING

NTS

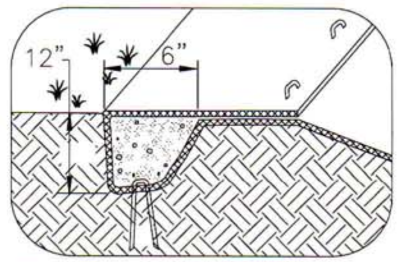
NOTES:

1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
3. Install per manufacturer's recommendations

TYPICAL INSTALLATION DETAIL



INITIAL CHANNEL ANCHOR TRENCH
NTS



TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH
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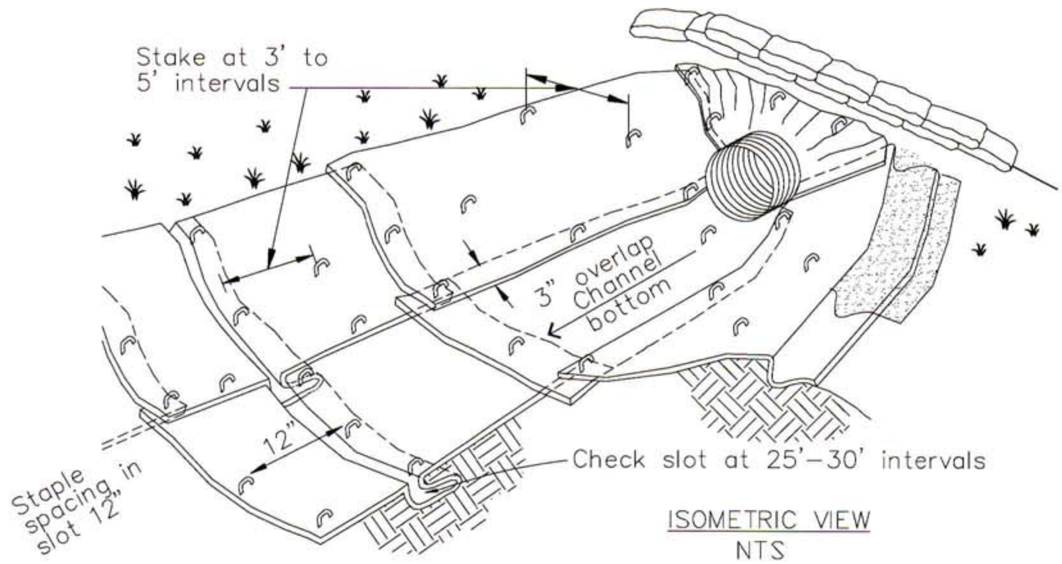
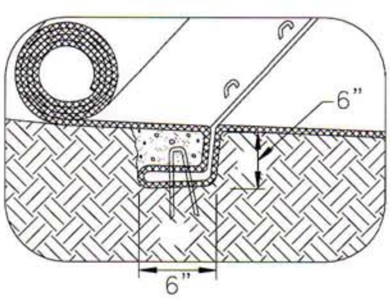
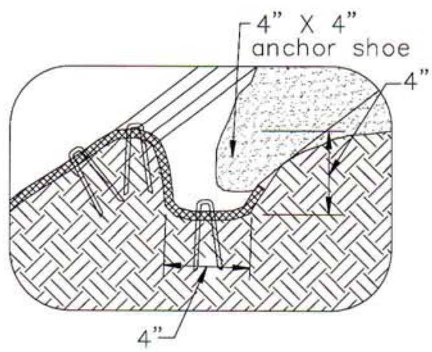


ISOMETRIC VIEW
NTS



INTERMITTENT CHECK SLOT
NTS

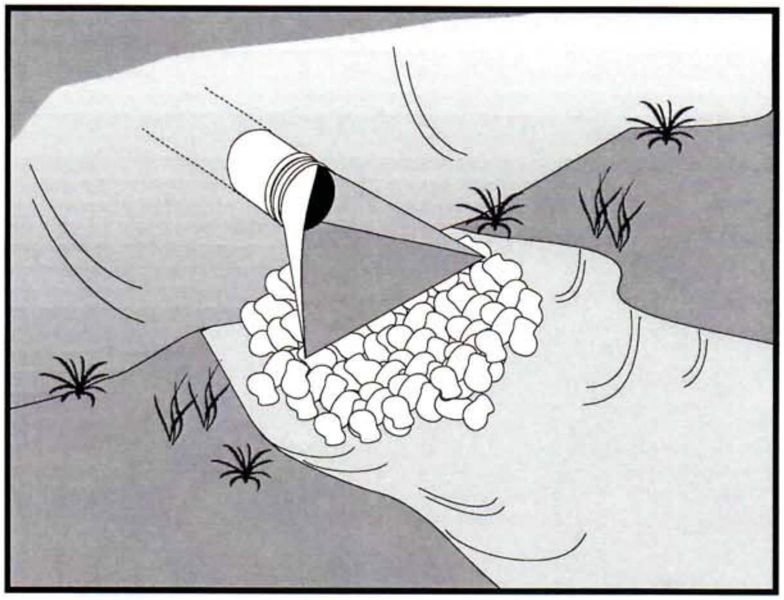


LONGITUDINAL ANCHOR TRENCH
NTS

NOTES:
1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.
3. Install per manufacturer's recommendations

TYPICAL INSTALLATION DETAIL

Velocity Dissipation Devices EC-10



Categories

EC	Erosion Control	☑
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divert runon during construction.

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances

Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

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- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in velocity dissipation devices.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plange pools), and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.

- Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.

- Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.

- Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.

- 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.

- Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $150 per device.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.

- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.

- Inspect 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.

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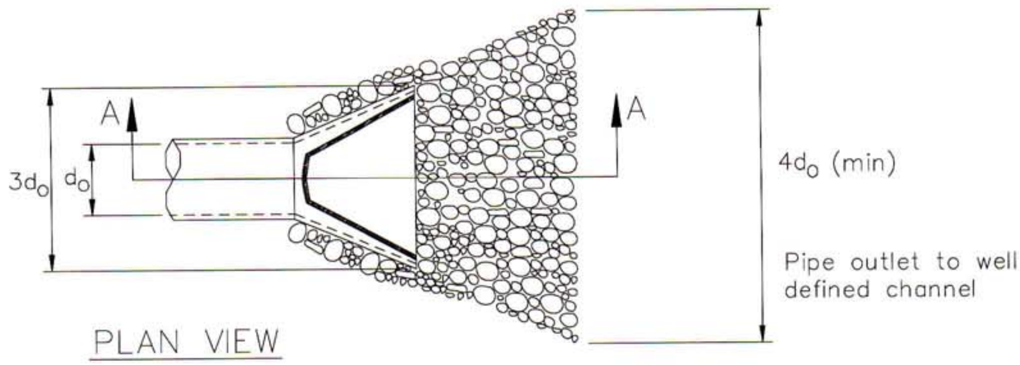

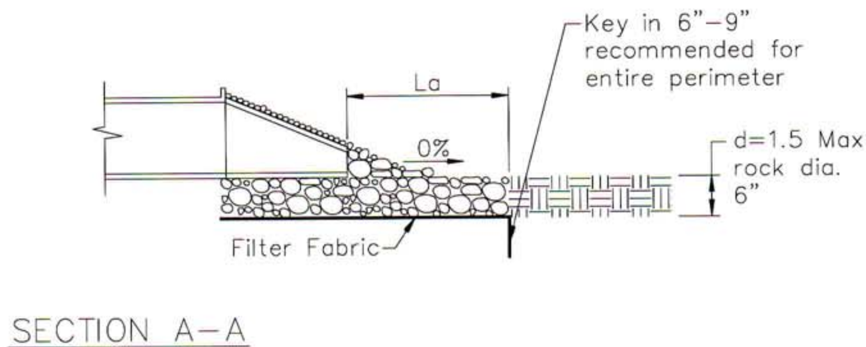

Pipe Diameter inches	Discharge ft³/s	Apron Length, La ft	Rip Rap D_{50} Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS

Streambank Stabilization EC-12

Categories

EC	Erosion Control	☑
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

Combination of erosion and sediment controls.

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Description and Purpose

Stream channels, streambanks, 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. BMPs can reduce the discharge of sediment and other pollutants to minimize the impact of construction activities on watercourses. Streams on the 303(d) list and listed for sediment may require numerous measures to prevent any increases in sediment load to the stream.

Suitable 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 supercede the guidance in this BMP.

- If numerical based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required. Streams listed as 303(d) impaired for sediment, silt, or turbidity, are required to conduct sampling to verify that there is no net increase in sediment load due to construction activities.

Implementation

Planning

- Proper planning, design, and construction techniques can minimize impacts normally associated with in stream construction activities. Poor planning can adversely affect soil, fish, wildlife resources, land uses, or land users. Planning should take into account: scheduling; avoidance of in-stream construction; minimizing disturbance area and construction time period; using pre-disturbed areas; selecting crossing location; and selecting equipment.

Scheduling

- Construction activities should be scheduled according to the relative sensitivity of the environmental concerns and in accordance with EC-1, Scheduling. Scheduling considerations will be different when working near perennial streams vs. ephemeral streams and are as follows.

- When in-stream construction is conducted in a perennial stream, work should optimally be performed during the rainy season. This is because in the summer, any sediment-containing water that is discharged into the watercourse will cause a large change in both water clarity and water chemistry. During the rainy season, there is typically more and faster flowing water in the stream so discharges are diluted faster. However, should in-stream work be scheduled for summer, establishing an isolation area, or diverting the stream, will significantly decrease the amount of sediment stirred up by construction work. Construction work near perennial streams should optimally be performed during the dry season (see below).

- When working in or near ephemeral streams, work should be performed during the dry season. By their very nature, ephemeral streams are usually dry in the summer, and therefore, in-stream construction activities will not cause significant water quality problems. However, when tying up the site at the end of the project, wash any fines (see Washing Fines) that accumulated in the channel back into the bed material, to decrease pollution from the first rainstorm of the season.

- When working near ephemeral or perennial streams, erosion and sediment controls (see silt fences, straw bale barriers, etc.) should be implemented to keep sediment out of stream channel.

Minimize Disturbance

- Minimize disturbance through: selection of the narrowest crossing location; limiting the number of equipment trips across a stream during construction; and, minimizing the number and size of work areas (equipment staging areas and spoil storage areas). Place work areas at least 50 ft from stream channel. Field reconnaissance should be conducted during the planning stage to identify work areas.

Use of Pre-Disturbed Areas

- Locate project sites and work areas in areas disturbed by prior construction or other activity when possible.

Selection of Project Site

- Avoid steep and unstable banks, highly erodible or saturated soils, or highly fractured rock.
- Select project site that minimizes disturbance to aquatic species or habitat.

Equipment Selection

- 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 lb/in^2, where possible. Low ground pressure equipment includes: wide or high flotation tires (34 to 72 in. wide); dual tires; bogie axle systems; tracked machines; lightweight equipment; and, central tire inflation systems.

Streambank Stabilization

Preservation of Existing Vegetation

- Preserve existing vegetation in accordance with EC-2, Preservation of Existing Vegetation. In a streambank environment, preservation of existing vegetation provides the following benefits.

Water Quality Protection

- Vegetated buffers on slopes trap sediment and promote groundwater recharge. The buffer width needed to maintain water quality ranges from 15 to 100 ft. On gradual slopes, most of the filtering occurs within the first 30 ft. Steeper slopes require a greater width of vegetative buffer to provide water quality benefits.

Streambank Stabilization

- The root system of riparian vegetation stabilizes streambanks by increasing tensile strength in the soil. The presence of vegetation modifies the moisture condition of slopes (infiltration, evapo transpiration, interception) and increases bank stability.

Riparian Habitat

- Buffers of diverse riparian vegetation provide food and shelter for riparian and aquatic organisms. Minimizing impacts to fisheries habitat is a major concern when working near streams and rivers. Riparian vegetation provides shade, shelter, organic matter (leaf detritus and large woody debris), and other nutrients that are necessary for fish and other aquatic organisms. Buffer widths for habitat concerns are typically wider than those recommended for water quality concerns (100 to 1500 ft).
- When working near watercourses, it is important to understand the work site's placement in the watershed. Riparian vegetation in headwater streams has a greater impact on overall water quality than vegetation in downstream reaches. Preserving existing vegetation upstream is necessary to maintain water quality, minimize bank failure, and maximize riparian habitat, downstream of the work site.

Limitations

- Local county and municipal ordinances regarding width, extent and type of vegetative buffer required may exceed the specifications provided here; these ordinances should be investigated prior to construction.

Streambank Stabilization Specific Installation

- As a general rule, the width of a buffer strip between a road and the stream is recommended to be 50 ft plus four times the percent slope of the land, measured between the road and the top of stream bank.

Hydraulic Mulch

- Apply hydraulic mulch on disturbed streambanks above mean high water level in accordance with EC-3, Hydraulic Mulch to provide temporary soil stabilization.

Limitations

- Do not place hydraulic mulch or tackifiers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication (eutrophication is an algal bloom caused by excessively high nutrient levels in the water).

Hydroseeding

- Hydroseed disturbed streambanks in accordance with EC-4, Hydroseeding.

Limitations

- Do not place tackifiers or fertilizers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication.

Soil Binders

- Apply soil binders to disturbed streambanks in accordance with EC-5, Soil Binders.

Limitations

- Do not place soil binders below the mean high water level. Soil binder must be environmentally benign and non-toxic to aquatic organisms.

Straw Mulch

- Apply straw mulch to disturbed streambanks in accordance with EC-6, Straw Mulch.

Limitations

- Do not place straw mulch below the mean high water level, as this material could wash into the channel and impact water quality or possibly cause eutrophication.

Geotextiles and Mats

- Install geotextiles and mats as described in EC-7, Geotextiles and Mats, to stabilize disturbed channels and streambanks. Not all applications should be in the channel, for example, certain geotextile netting may snag fish gills and are not appropriate in fish bearing streams. Geotextile fabrics that are not biodegradable are not appropriate for in stream use. Additionally, geotextile fabric or blankets placed in channels must be adequate to sustain anticipated hydraulic forces.

Earth Dikes, Drainage Swales, and Lined Ditches

- Convey, intercept, or divert runoff from disturbed streambanks using EC-9, Earth Dikes and Drainage Swales.

Limitations

- Do not place earth dikes in watercourses, as these structures are only suited for intercepting sheet flow, and should not be used to intercept concentrated flow.

- Appropriately sized velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

Velocity Dissipation Devices

- Place velocity dissipation devices at outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels in accordance with EC-10, Velocity Dissipation Devices.

Slope Drains

- Use slope drains to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device or stabilized area in accordance with EC-11, Slope Drains.

Limitations

- Appropriately sized outlet protection and velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

Streambank Sediment Control

Silt Fences

- Install silt fences in accordance with SE-1, Silt Fence, to control sediment. Silt fences should only be installed where sediment laden water can pond, thus allowing the sediment to settle out.

Fiber Rolls

- Install fiber rolls in accordance with SE-5, Fiber Rolls, along contour of slopes above the high water level to intercept runoff, reduce flow velocity, release the runoff as sheet flow and provide removal of sediment from the runoff. In a stream environment, fiber rolls should be used in conjunction with other sediment control methods such as SE-1, Silt Fence or SE-9 Straw Bale Barrier. Install silt fence, straw bale barrier, or other erosion control method along toe of slope above the high water level.

Gravel Bag Berm

- A gravel bag berm or barrier can be utilized to intercept and slow the flow of sediment laden sheet flow runoff in accordance with SE-6, Gravel Bag Berm. In a stream environment gravel bag barriers can allow sediment to settle from runoff before water leaves the construction site and can be used to isolate the work area from the live stream.

Limitations

- Gravel bag barriers are not recommended as a perimeter sediment control practice around streams.

Straw Bale Barrier

- Install straw bale barriers in accordance with SE-9, Straw Bale Barrier, to control sediment. Straw bale barriers should only be installed where sediment laden water can pond, thus allowing the sediment to settle out. Install a silt fence in accordance with SE-1, Silt Fence, on down slope side of straw bale barrier closest to stream channel to provide added sediment control.

Rock Filter

Description and Purpose

Rock filters are temporary erosion control barriers composed of rock that is anchored in place. Rock filters detain the sediment laden runoff, retain the sediment, and release the water as sheet flow at a reduced velocity. Typical rock filter installations are illustrated at the end of this BMP.

Applications

- Near the toe of slopes that may be subject to flow and rill erosion.

Limitations

- Inappropriate for contributing drainage areas greater than 5 acres.
- Requires sufficient space for ponded water.
- Ineffective for diverting runoff because filters allow water to slowly seep through.
- Rock filter berms are difficult to remove when construction is complete.
- Unsuitable in developed areas or locations where aesthetics is a concern.

Specifications

- Rock: open graded rock, 0.75 to 5 in. for concentrated flow applications.
- Woven wire sheathing: 1 in. diameter, hexagonal mesh, galvanized 20gauge (used with rock filters in areas of concentrated flow).
- In construction traffic areas, maximum rock berm heights should be 12 in. Berms should be constructed every 300 ft on slopes less than 5%, every 200 ft on slopes between 5% and 10%, and every 100 ft on slopes greater than 10%.

Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Reshape berms as needed and replace lost or dislodged rock, and filter fabric.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.

K-rail

Description and Purpose

This is temporary sediment control that uses K-rails to form the sediment deposition area, or to isolate the near bank construction area. Install K-rails at toe of slope in accordance with procedures described in NS-5, Clear Water Diversion.

Barriers are placed end to end in a pre-designed configuration and gravel filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

Appropriate Applications

- This technique is useful at the toe of embankments, cuts or fills slopes.

Limitations

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

Implementation

- Refer to NS-5, Clear Water Diversion, for implementation requirements.

Instream Construction Sediment Control

There are three different options currently available for reducing turbidity while working in a stream or river. The stream can be isolated from the area in which work is occurring by means of a water barrier, the stream can be diverted around the work site through a pipe or temporary channel, or one can employ construction practices that minimize sediment suspension.

Whatever technique is implemented, an important thing to remember is that dilution can sometimes be the solution. A probable "worst time" to release high TSS into a stream system might be when the stream is very low; summer low flow, for example. During these times, the flow may be low while the biological activity in the stream is very high. Conversely, the addition of high TSS or sediment during a big storm discharge might have a relatively low impact, because the stream is already turbid, and the stream energy is capable of transporting both suspended solids, and large quantities of bedload through the system. The optimum time to "pull" in-stream structures may be during the rising limb of a storm hydrograph.

Techniques to minimize Total Suspended Solids (TSS)

- **Padding** - Padding laid in the stream below the work site may trap some solids that are deposited in the stream during construction. After work is done, the padding is removed from the stream, and placed on the bank to assist in re-vegetation.

- **Clean, washed gravel** - Using clean, washed gravel decreases solid suspension, as there are fewer small particles deposited in the stream.

- **Excavation using a large bucket** - Each time a bucket of soil is placed in the stream, a portion is suspended. Approximately the same amount is suspended whether a small amount of soil is placed in the stream, or a large amount. Therefore, using a large excavator bucket instead of a small one, will reduce the total amount of soil that washes downstream.

- **Use of dozer for backfilling** - Using a dozer for backfilling instead of a backhoe follows the same principles – the fewer times soil is deposited in the stream, the less soil will be suspended.

- **Partial dewatering with a pump** - Partially dewatering a stream with a pump reduces the amount of water, and thus the amount of water that can suspend sediment.

Washing Fines

Definition and Purpose

- Washing fines is an "in-channel" sediment control method, which uses water, either from a water truck or hydrant, to wash stream fines that were brought to the surface of the channel bed during restoration, back into the interstitial spaces of the gravel and cobbles.

- The purpose of this technique is to reduce or eliminate the discharge of sediment from the channel bottom during the first seasonal flow. Sediment should not be allowed into stream channels; however, occasionally in-channel restoration work will involve moving or otherwise disturbing fines (sand and silt sized particles) that are already in the stream, usually below bankfull discharge elevation. Subsequent re-watering of the channel can result in a plume of turbidity and sedimentation.

- This technique washes the fines back into the channel bed. Bedload materials, including gravel cobbles, boulders and those fines, are naturally mobilized during higher storm flows. This technique is intended to delay the discharge until the fines would naturally be mobilized.

Appropriate Applications

- This technique should be used when construction work is required in channels. It is especially useful in intermittent or ephemeral streams in which work is performed "in the dry", and which subsequently become re-watered.

Limitations

- The stream must have sufficient gravel and cobble substrate composition.

- The use of this technique requires consideration of time of year and timing of expected stream flows.

- The optimum time for the use of this technique is in the fall, prior to winter flows.

- Consultation with, and approval from the Department of Fish and Game and the Regional Water Quality Control Board may be required.

Implementation

- Apply sufficient water to wash fines, but not cause further erosion or runoff.

- Apply water slowly and evenly to prevent runoff and erosion.

- Consult with Department of Fish and Game and the Regional Water Quality Control Board for specific water quality requirements of applied water (e.g. chlorine).

Inspection and Maintenance

- None necessary

Costs

Cost may vary according to the combination of practices implemented.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

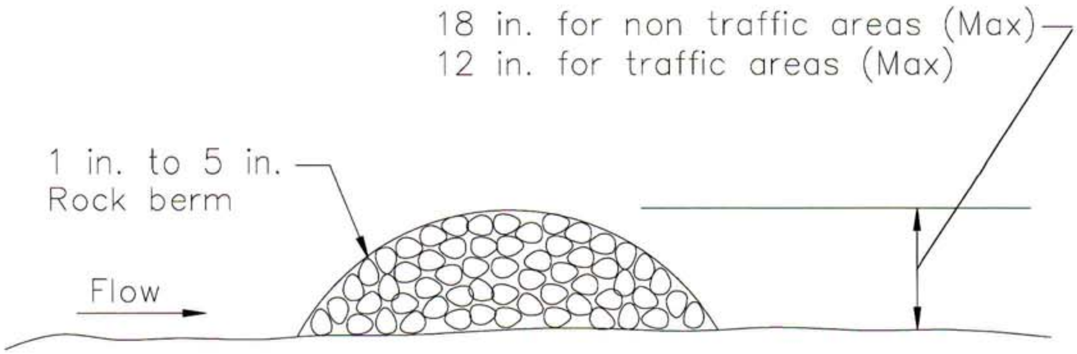
Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, An Inventory of Current Practices (Draft), UESPA, 1990.

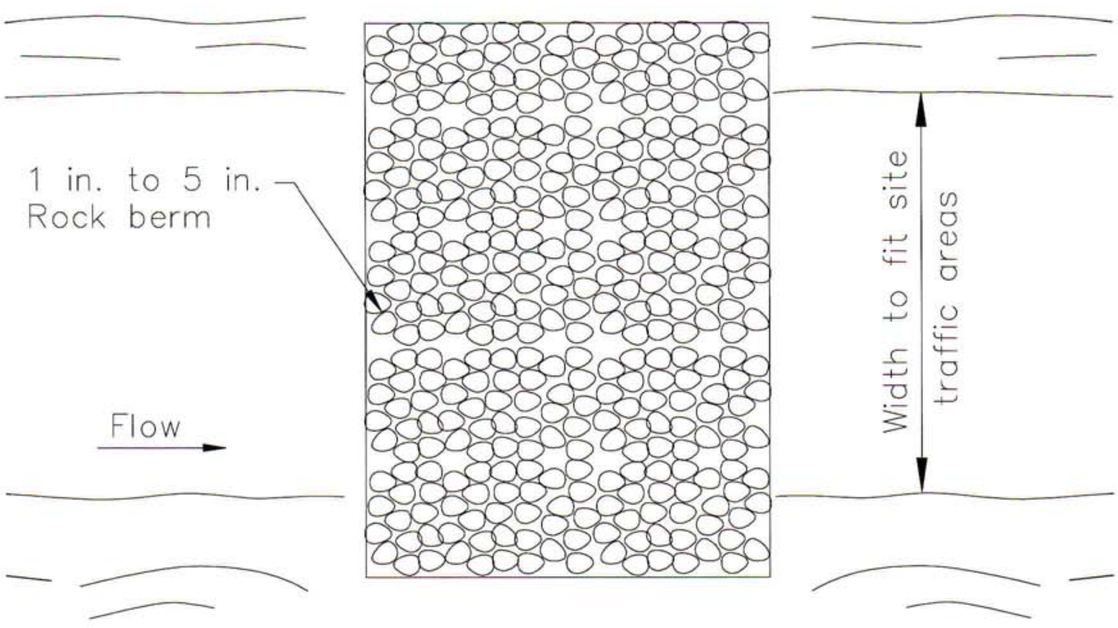
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



SECTION



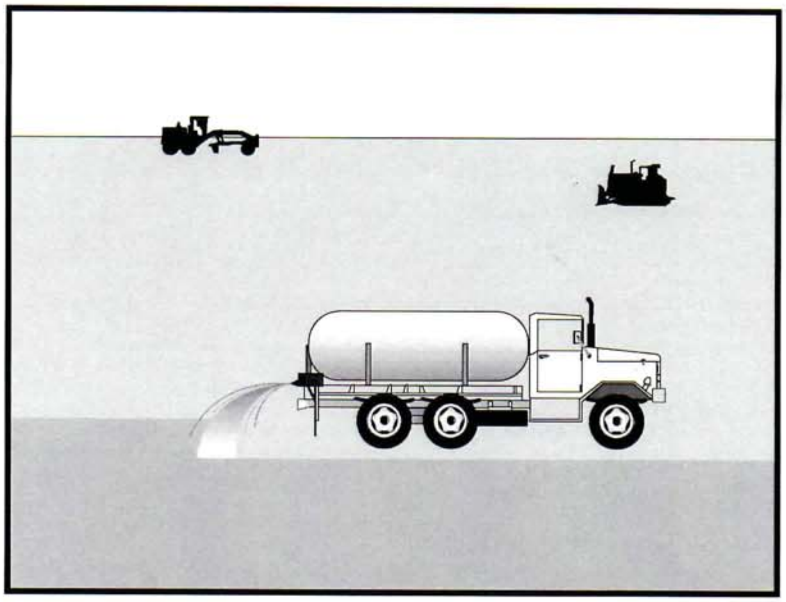
PLAN

TYPICAL ROCK FILTER

NOT TO SCALE

Wind Erosion Control

WE-1



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☑
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-5 Soil Binders

Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit.

Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:

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- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montimorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	x	x	x	x	x			x
Disturbed Areas Subject to Traffic			x	x	x	x		x
Material Stockpiles		x	x	x			x	x
Demolition			x			x	x	
Clearing/ Excavation			x	x				x
Truck Traffic on Unpaved Roads			x	x	x	x	x	
Tracking					x	x		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

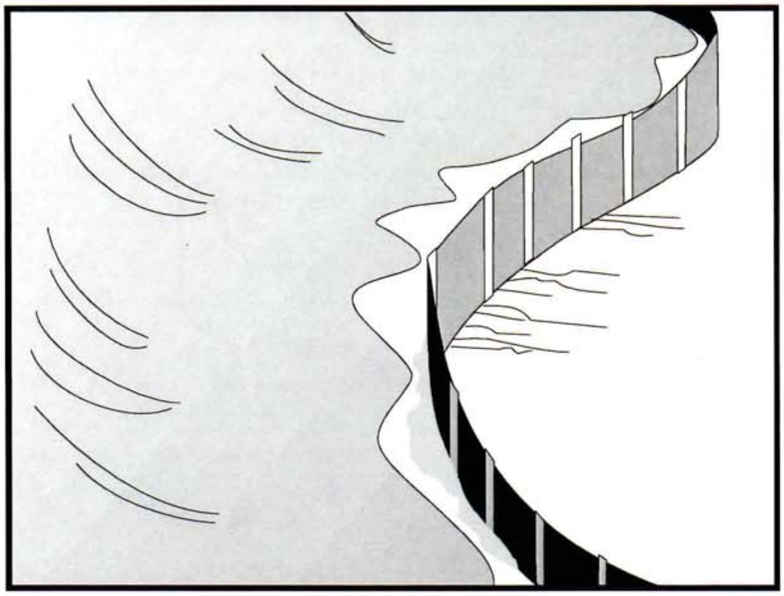
California Air Pollution Control Laws, California Air Resources Board, updated annually.

Construction Manual, Chapter 4, Section 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative", California Department of Transportation (Caltrans), July 2001.

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Silt Fence



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Targeted Constituents

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Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-10 Storm Drain Inlet Protection

SE-14 Biofilter Bags

Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard. Runoff typically ponds temporarily on the upstream side of silt fence.
- Do not use silt fence to divert water flows or place across any contour line. Fences not constructed on a level contour, or fences used to divert flow will concentrate flows resulting in additional erosion and possibly overtopping or failure of the silt fence.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Not effective unless trenched and keyed in.
- Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.

- Silt fences should remain in place until the disturbed area is permanently stabilized, after which, the silt fence should be removed and properly disposed.
- Silt fence should be used in combination with erosion source controls up slope in order to provide the most effective sediment control.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Woven geotextile material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the slope of area draining to the silt fence is 4:1 (H:V) or less.
- Used for shorter durations, typically 5 months or less
- Area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Use is generally limited to 8 months or less.
- Area draining to fence produces moderate sediment loads.
- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
  - Fence fabric has higher tensile strength.
  - Fabric is reinforced with wire backing or additional support.
  - Posts are spaced closer than pre-manufactured, standard silt fence products.
  - Posts are metal (steel or aluminum)

Materials

Standard Silt Fence

- Silt fence material should be woven geotextile with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.

- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts or bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement for health and safety purposes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench.

- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.

- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with native material and compacted.

- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where, due to specific site conditions, a 3 ft setback is not available, the silt fence may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and more difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.

- Cross barriers should be a minimum of $^1/_3$ and a maximum of ½ the height of the linear barrier.

- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the gerotextile is installed, the soil is compacted using tractor tires.

- This method will not work with pre-fabricated, wire backed silt fence.

- Benefits:
    - Ease of installation (most often done with a 2 person crew). In addition, installation using static slicing has been found to be more efficient on slopes, in rocky soils, and in saturated soils.
    - Minimal soil disturbance.
    - Greater level of compaction along fence, leading to higher performance (i.e. greater sediment retention).
    - Uniform installation.
    - Less susceptible to undercutting/undermining.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.

- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is $7 per linear foot based on vendor research. Range of cost is $3.50 - $9.10 per linear foot.

- In tests, the slicing method required 0.33 man hours per 100 linear feet, while the trenched based systems required as much as 1.01 man hours per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Repair undercut silt fences.

- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.
- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

References

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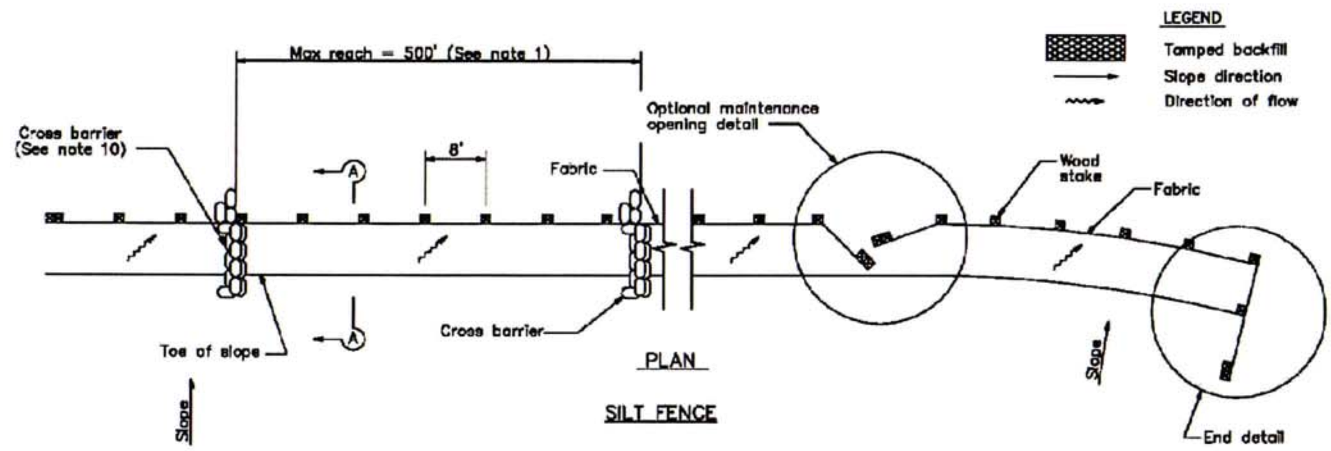
U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

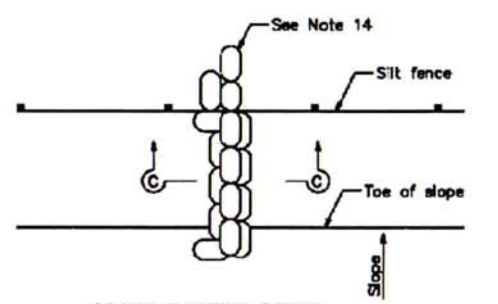
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

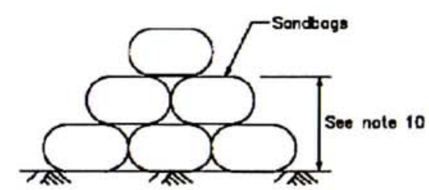


PLAN

SILT FENCE



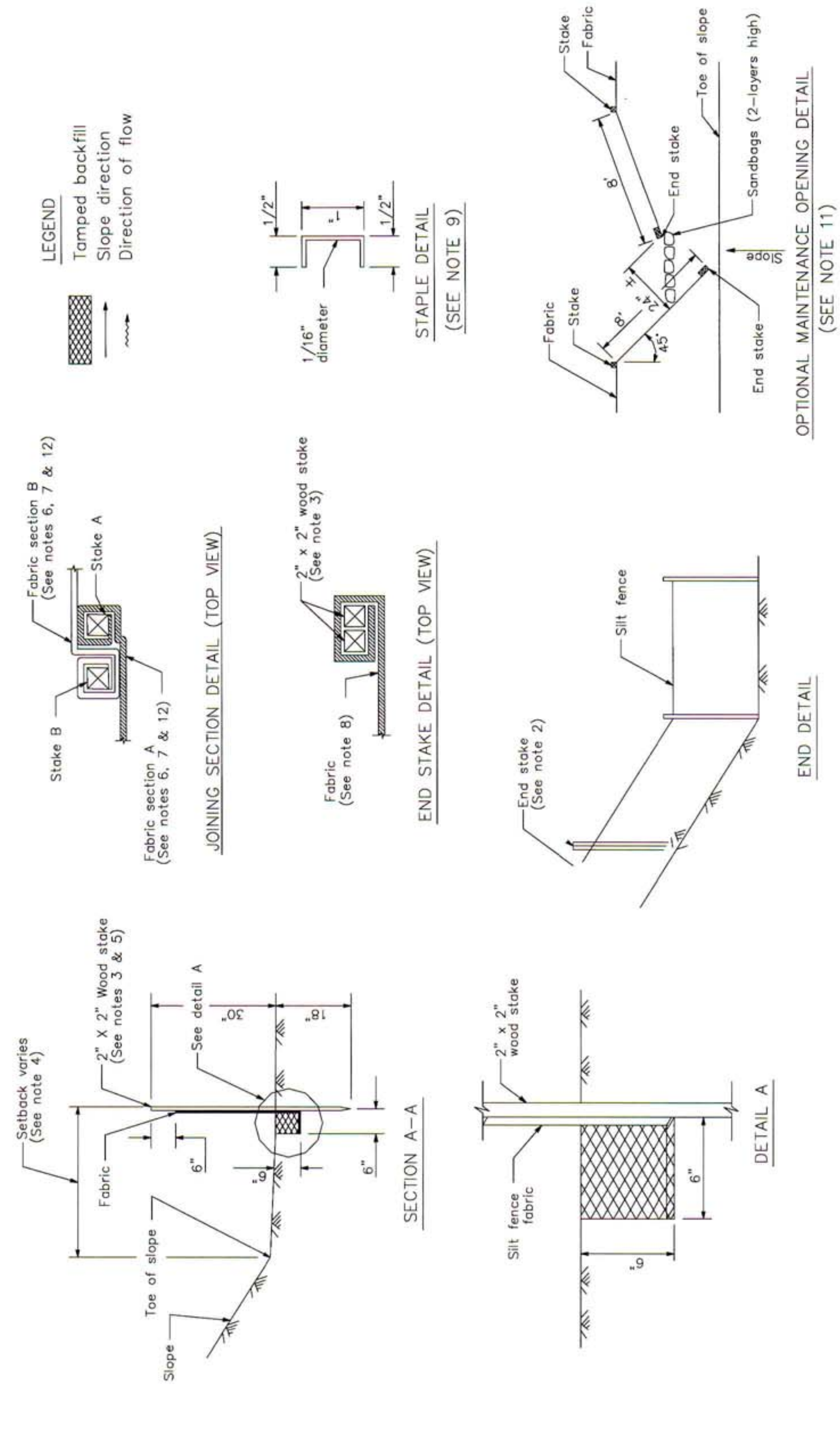
CROSS BARRIER DETAIL



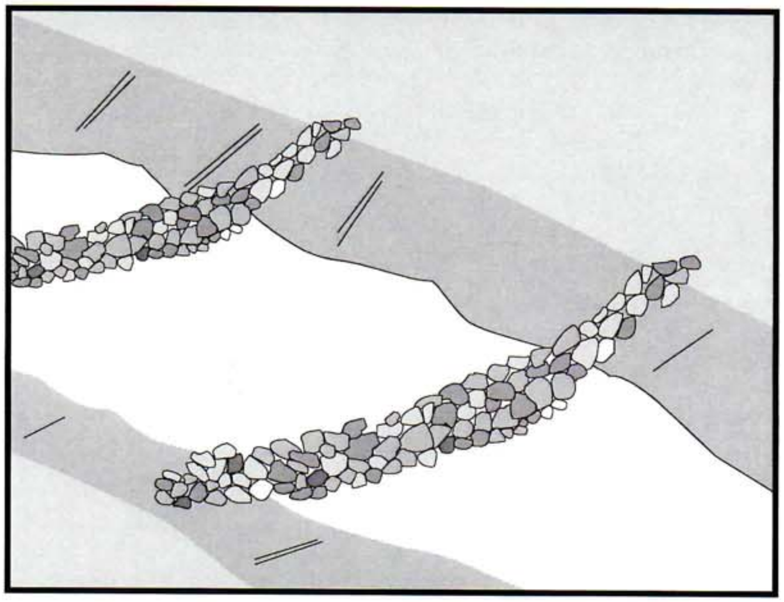
SECTION C–C

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The last 8'–0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'–0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow–through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
14. Add 3–4 bags to cross barrier on downgradient side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.



LEGEND
Tamped backfill
Slope direction
Direction of flow
Fabric section B (See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A (See notes 6, 7 & 12)
JOINING SECTION DETAIL (TOP VIEW)
2" x 2" wood stake (See note 3)
Fabric (See note 8)
END STAKE DETAIL (TOP VIEW)
1/2"
1"
1/2"
1/16" diameter
STAPLE DETAIL
(SEE NOTE 9)
Stake
Fabric
8'
End stake
Toe of slope
Sandbags (2-layers high)
Slope
2'-4'±
45°
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)
Setback varies (See note 4)
2" X 2" Wood stake (See notes 3 & 5)
See detail A
30"
18"
6"
Toe of slope
Slope
SECTION A-A
End stake (See note 2)
Silt fence
END DETAIL
2" x 2" wood stake
Silt fence fabric
DETAIL A



Categories

EC	Erosion Control	☒
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

A check dam is a small barrier constructed of rock, gravel bags, sandbags, fiber rolls, or other proprietary products, placed across a constructed swale or drainage ditch. Check dams reduce the effective slope of the channel, thereby reducing scour and channel erosion by reducing flow velocity and increasing residence time within the channel, allowing sediment to settle.

Suitable Applications

Check dams may be appropriate in the following situations:

- To promote sedimentation behind the dam.
- To prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- In small open channels that drain 10 acres or less.
- In steep channels where stormwater runoff velocities exceed 5 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.
- To act as a grade control structure.

Limitations

- Not to be used in live streams or in channels with extended base flows.
- Not appropriate in channels that drain areas greater than 10 acres.
- Not appropriate in channels that are already grass-lined unless erosion potential or sediment-laden flow is expected, as installation may damage vegetation.
- Require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.
- Do not construct check dams with straw bales or silt fence.
- Water suitable for mosquito production may stand behind check dams, particularly if subjected to daily non-stormwater discharges.

Implementation

General

Check dams reduce the effective slope and create small pools in swales and ditches that drain 10 acres or less. Using check dams to reduce channel slope reduces the velocity of stormwater flows, thus reducing erosion of the swale or ditch and promoting sedimentation. Thus, check dams are dual-purpose and serve an important role as erosion controls as well as as sediment controls. Note that use of 1-2 isolated check dams for sedimentation will likely result in little net removal of sediment because of the small detention time and probable scour during longer storms. Using a series of check dams will generally increase their effectiveness. A sediment trap (SE-3) may be placed immediately upstream of the check dam to increase sediment removal efficiency.

Design and Layout

Check dams work by decreasing the effective slope in ditches and swales. An important consequence of the reduced slope is a reduction in capacity of the ditch or swale. This reduction in capacity should be considered when using this BMP, as reduced capacity can result in overtopping of the ditch or swale and resultant consequences. In some cases, such as a "permanent" ditch or swale being constructed early and used as a "temporary" conveyance for construction flows, the ditch or swale may have sufficient capacity such that the temporary reduction in capacity due to check dams is acceptable. When check dams reduce capacities beyond acceptable limits, either:

- Don't use check dams. Consider alternative BMPs, or.
- Increase the size of the ditch or swale to restore capacity.

Maximum slope and velocity reduction is achieved when the toe of the upstream dam is at the same elevation as the top of the downstream dam (see "Spacing Between Check Dams" detail at the end of this fact sheet). The center section of the dam should be lower than the edge sections (at least 6 inches), acting as a spillway, so that the check dam will direct flows to the center of the ditch or swale (see "Typical Rock Check Dam" detail at the end of this fact sheet). Bypass or side-cutting can occur if a sufficient spillway is not provided in the center of the dam.

Check dams are usually constructed of rock, gravel bags, sandbags, and fiber rolls. A number of products can also be used as check dams (e.g. HDPE check dams, temporary silt dikes (SE-12)), and some of these products can be removed and reused. Check dams can also be constructed of logs or lumber, and have the advantage of a longer lifespan when compared to gravel bags, sandbags, and fiber rolls. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

Rock check dams are usually constructed of 8 to 12 in. rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam should completely span the ditch or swale to prevent washout. The rock used should be large enough to stay in place given the expected design flow through the channel. It is recommended that abutments be extended 18 in. into the channel bank. Rock can be graded such that smaller diameter rock (e.g. 2-4 in) is located on the upstream side of larger rock (holding the smaller rock in place); increasing residence time.

Log check dams are usually constructed of 4 to 6 in. diameter logs, installed vertically. The logs should be embedded into the soil at least 18 in. Logs can be bolted or wired to vertical support logs that have been driven or buried into the soil.

See fiber rolls, SE-5, for installation of fiber roll check dams.

Gravel bag and sand bag check dams are constructed by stacking bags across the ditch or swale, shaped as shown in the drawings at the end of this fact sheet (see "Gravel Bag Check Dam" detail at the end of this fact sheet).

Manufactured products, such as temporary silt dikes (SE-12), should be installed in accordance with the manufacturer's instructions. Installation typically requires anchoring or trenching of products, as well as regular maintenance to remove accumulated sediment and debris.

If grass is planted to stabilize the ditch or swale, the check dam should be removed when the grass has matured (unless the slope of the swales is greater than 4%).

The following guidance should be followed for the design and layout of check dams:

- Install the first check dam approximately 16 ft from the outfall device and at regular intervals based on slope gradient and soil type.
- Check dams should be placed at a distance and height to allow small pools to form between each check dam.
- For multiple check dam installation, backwater from a downstream check dam should reach the toes of the upstream check dam.
- A sediment trap provided immediately upstream of the check dam will help capture sediment. Due to the potential for this sediment to be resuspended in subsequent storms, the sediment trap should be cleaned following each storm event.

- High flows (typically a 2-year storm or larger) should 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 should be removed when grass has matured sufficiently to protect the ditch or swale.

Materials

- Rock used for check dams should typically be 8-12 in rock and be sufficiently sized to stay in place given expected design flows in the channel. Smaller diameter rock (e.g. 2 to 4 in) can be placed on the upstream side of larger rock to increase residence time.

- Gravel bags used for check dams should conform to the requirements of SE-6, Gravel Bag Berms.

- Sandbags used for check dams should conform to SE-8, Sandbag Barrier.

- Fiber rolls used for check dams should conform to SE-5, Fiber Rolls.

- Temporary silt dikes used for check dams should conform to SE-12, Temporary Silt Dikes.

Installation

- Rock should be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.

- Tightly abut bags and stack according to detail shown in the figure at the end of this section (pyramid approach). Gravel bags and sandbags should not be stacked any higher than 3 ft.

- Upper rows or gravel and sand bags shall overlap joints in lower rows.

- Fiber rolls should be trenched in, backfilled, and firmly staked in place.

- Install along a level contour.

- HDPE check dams, temporary silt dikes, and other manufactured products should be used and installed per manufacturer specifications.

Costs

Cost consists of labor costs if materials are readily available (such as gravel on-site). If material must be imported, costs will increase. For other material and installation costs, see SE-5, SE-6, SE-8, SE-12, and SE-14.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Replace missing rock, bags, rolls, etc. Replace bags or rolls that have degraded or have become damaged.

- If the check dam is used as a sediment capture device, sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- If the check dam is used as a grade control structure, sediment removal is not required as long as the system continues to control the grade.
- Inspect areas behind check dams for pools of standing water, especially if subjected to daily non-stormwater discharges.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.

References

Draft – Sedimentation and Erosion Control, and Inventory of Current Practices, USEPA, April 1990.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

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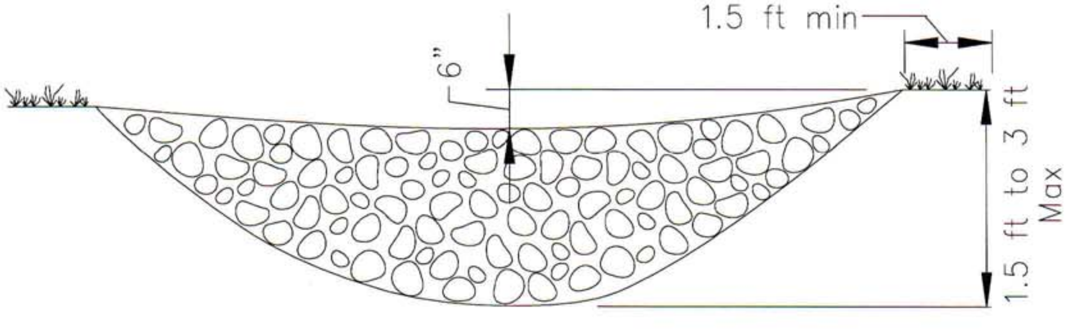
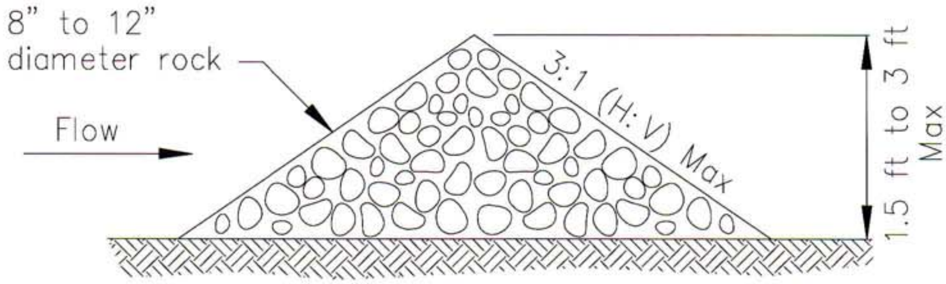
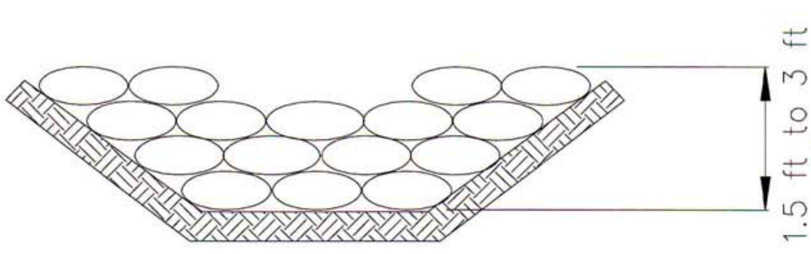


ELEVATION

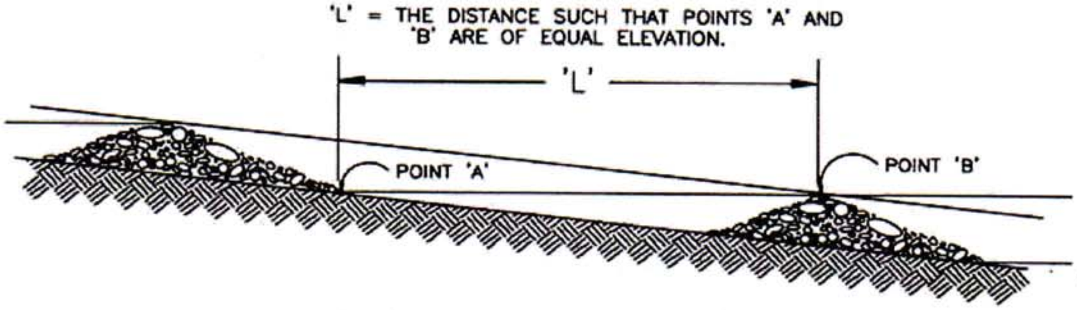


TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE



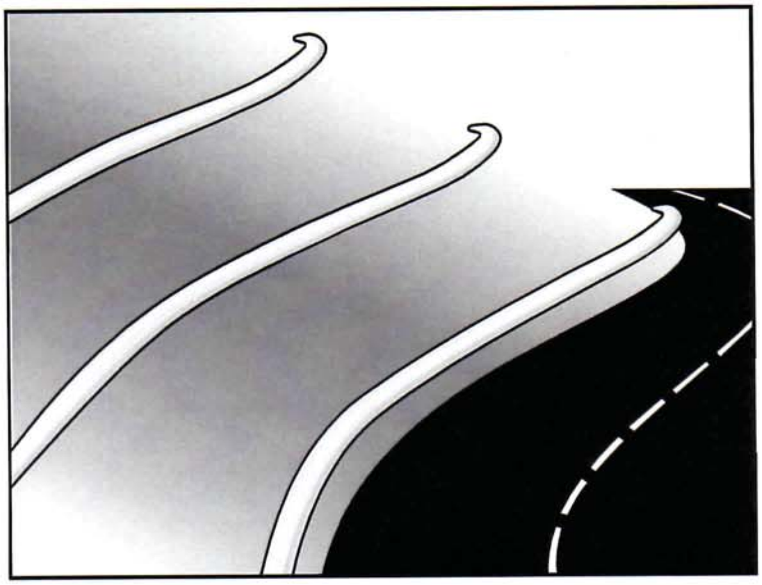
GRAVEL BAG CHECK DAM ELEVATION
NOT TO SCALE



SPACING BETWEEN CHECK DAMS

Fiber Rolls

SE-5



Categories

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☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

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- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be ¼ to 1/3 of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradeable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from $20 - $30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

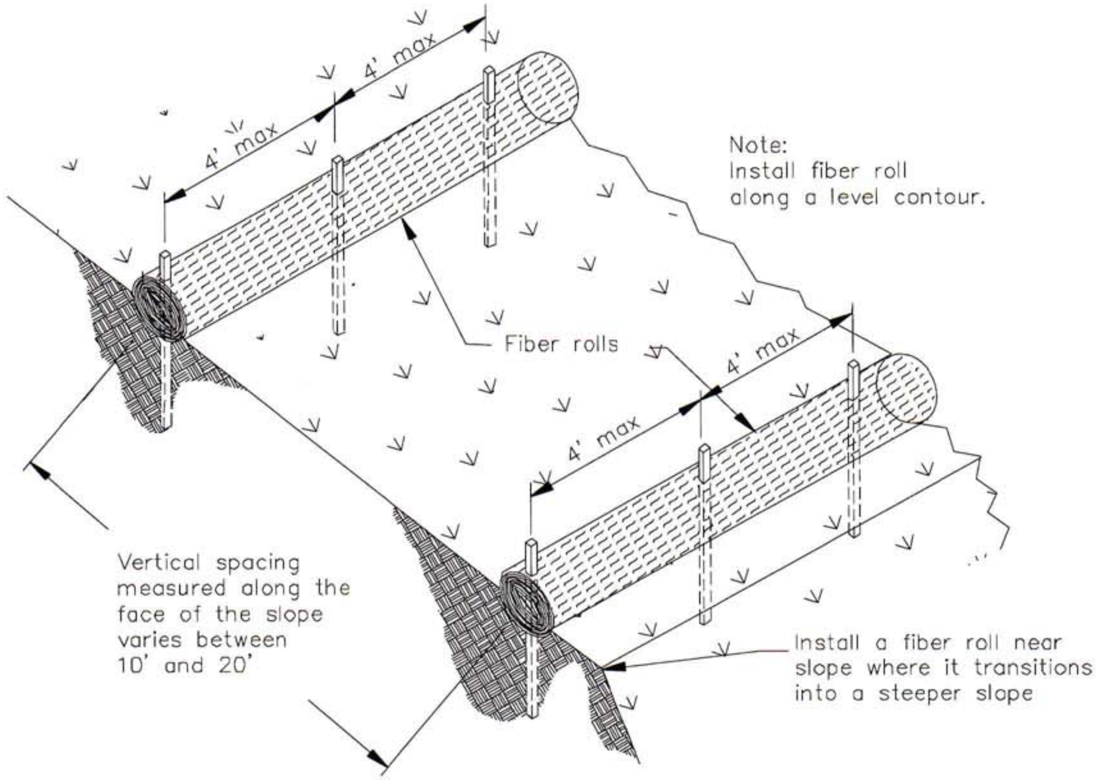
- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.

- Repair any rills or gullies promptly.

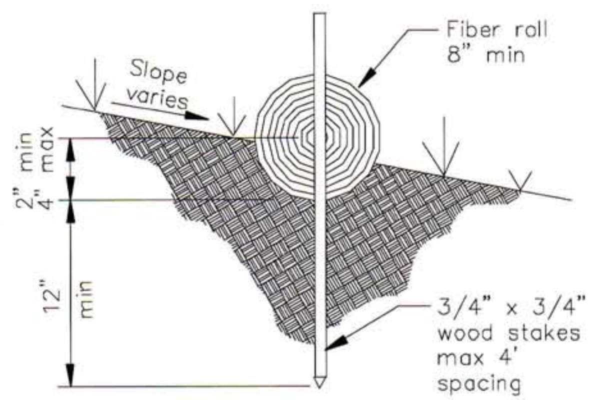
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

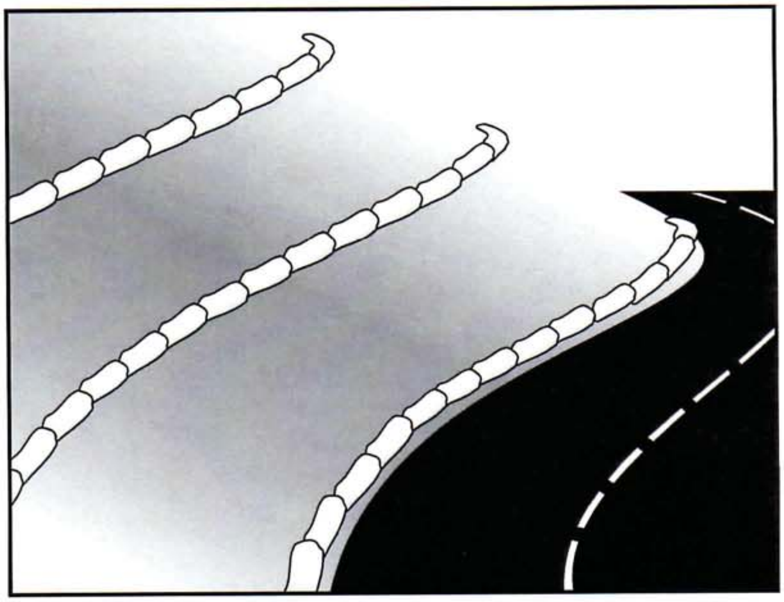
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



TYPICAL FIBER ROLL INSTALLATION
N.T.S.



ENTRENCHMENT DETAIL
N.T.S.



Categories

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Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Roll

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

A gravel bag berm is a series of gravel-filled bags placed on a level contour to intercept sheet flows. Gravel bags pond sheet flow runoff, allowing sediment to settle out, and release runoff slowly as sheet flow, preventing erosion.

Suitable Applications

Gravel bag berms may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As a linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

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- At the top of slopes to divert runoff away from disturbed slopes.
- As chevrons (small check dams) across mildly sloped construction roads. For use check dam use in channels, see SE-4, Check Dams.

Limitations

- Gravel berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Gravel bag berm may not be appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the berm, possibly causing flooding if sufficient space does not exist.
- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Durability of gravel bags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months.
- Easily damaged by construction equipment.
- When used to detain concentrated flows, maintenance requirements increase.

Implementation

General

A gravel bag berm consists of a row of open graded gravel-filled bags placed on a level contour. When appropriately placed, a gravel bag berm intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. The open graded gravel in the bags is porous, which allows the ponded runoff to flow slowly through the bags, releasing the runoff as sheet flows. Gravel bag berms also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils. Gravel bag berms are similar to sand bag barriers, but are more porous. Generally, gravel bag berms should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate gravel bag berms on level contours.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
  - Slope inclination of 4:1 (H:V) or flatter: Gravel bags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
  - Slope inclination between 4:1 and 2:1 (H:V): Gravel bags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Slope inclination 2:1 (H:V) or greater: Gravel bags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the gravel bag barriers up slope to prevent runoff from going around the berm.
- Allow sufficient space up slope from the gravel bag berm to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, gravel bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the gravel bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- In Non-Traffic Areas:
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Top width = 12 in. minimum for one or two layer construction
  - Side slopes = 2:1 (H:V) or flatter
- In Construction Traffic Areas:
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Top width = 12 in. minimum for one or two layer construction.
  - Side slopes = 2:1 (H:V) or flatter.
- Butt ends of bags tightly.
- On multiple row, or multiple layer construction, overlap butt joints of adjacent row and row beneath.
- Use a pyramid approach when stacking bags.

Materials

- ***Bag Material:*** Bags should be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

- ***Bag Size:*** Each gravel-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

- ***Fill Material:*** Fill material should be 0.5 to 1 in. crushed rock, clean and free from clay, organic matter, and other deleterious material, or other suitable open graded, non-cohesive, porous gravel.

Costs

Material costs for gravel bags are average and are dependent upon material availability. $2.50-3.00 per filled gravel bag is standard based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Gravel bags exposed to sunlight will need to be replaced every two to three months due to degrading of the bags.

- Reshape or replace gravel bags as needed.

- Repair washouts or other damage as needed.

- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.

- Remove gravel bag berms when no longer needed and recycle gravel fill whenever possible and properly dispose of bag material. Remove sediment accumulation and clean, re-grade, and stabilize the area.

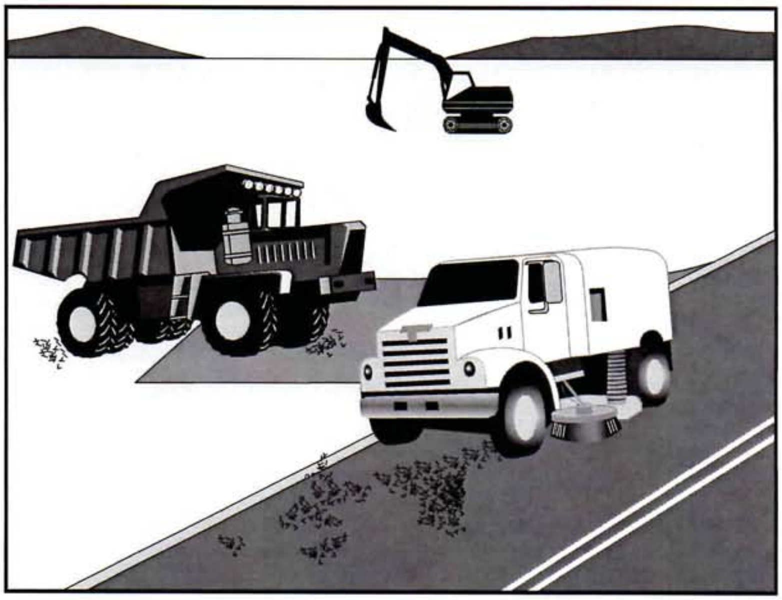
References

Handbook of Steel Drainage and Highway Construction, American Iron and Steel Institute, 1983.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Pollution Plan Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials and Research, October 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.

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- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

- When actively in use, points of ingress and egress must be inspected daily.

- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.

- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.

- Adjust brooms frequently; maximize efficiency of sweeping operations.

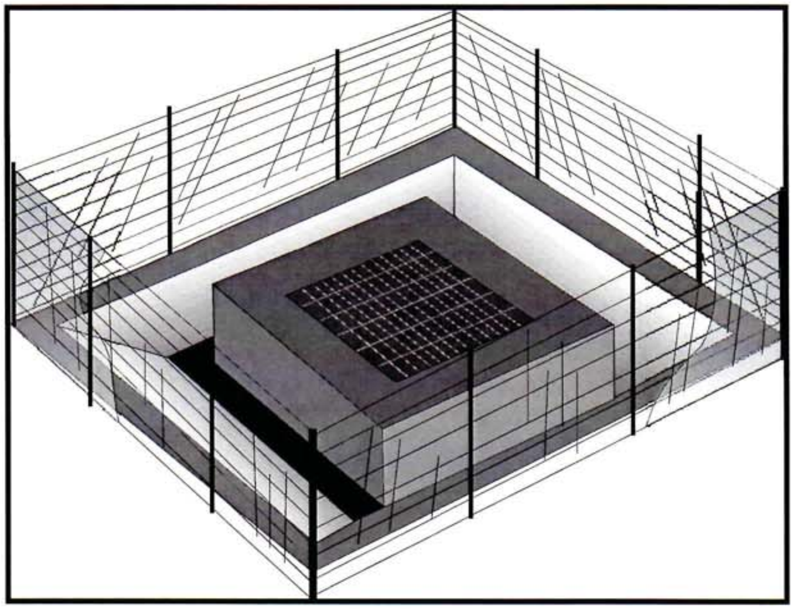
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Storm Drain Inlet Protection SE-10



Categories

EC	Erosion Control	
SE	Sediment Control	☑
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-14 Biofilter Bags

Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area in, around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction. Temporary geotextile storm drain inserts attach underneath storm drain grates to capture and filter storm water.

Suitable Applications

Every storm drain inlet receiving runoff from unstabilized or otherwise active work areas should be protected. Inlet protection should be used in conjunction with other erosion and sediment controls to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.

Limitations

- Drainage area should not exceed 1 acre.
- In general straw bales should not be used as inlet protection.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.

- Sediment removal may be inadequate to prevent sediment discharges in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use other onsite sediment trapping techniques in conjunction with inlet protection.
- Frequent maintenance is required.
- Limit drainage area to 1 acre maximum. For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap and/or used in conjunction with other drainage control, erosion control, and sediment control BMPs to protect the site. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Alternative methods are available in addition to the methods described/shown herein such as prefabricated inlet insert devices, or gutter protection devices.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- The key to successful and safe use of storm drain inlet protection devices is to know where runoff that is directed toward the inlet to be protected will pond or be diverted as a result of installing the protection device.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.

- Six types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
  - Silt Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
  - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
  - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
  - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
  - Temporary Geotextile Storm drain Inserts: Different products provide different features. Refer to manufacturer details for targeted pollutants and additional features.
  - Biofilter Bag Barrier: Used to create a small retention area upstream of inlets and can be located on pavement or soil. Biofilter bags slowly filter runoff allowing sediment to settle out. Appropriate for flows under 0.5 cfs.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- ***DI Protection Type 1 - Silt Fence*** - Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced and water flow through the grate will be blocked resulting in flooding. See typical Type 1 installation details at the end of this fact sheet.
  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes should be at least 48 in.
  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.

5. Backfill the trench with gravel or compacted earth all the way around.

- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap*** - Install filter fabric fence in accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd^3/acre of drainage area. See typical Type 2 installation details at the end of this fact sheet.

- ***DI Protection Type 3 - Gravel bag*** - Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability. See typical Type 3 installation details at the end of this fact sheet.

  1. Construct on gently sloping street.

  2. Leave room upstream of barrier for water to pond and sediment to settle.

  3. Place several layers of gravel bags – overlapping the bags and packing them tightly together.

  4. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

- ***DI Protection Type 4 – Block and Gravel Filter*** - Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction. See typical Type 4 installation details at the end of this fact sheet.

  1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place woven geotextile over the wire mesh.

  2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.

  3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.

  4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

- ***DI Protection Type 5 – Temporary Geotextile Insert (proprietary)*** – Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside of a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between manufacturers. Please refer to manufacturer instruction for installation of proprietary devices.

- ***DI Protection Type 6 - Biofilter bags*** – Biofilter bags may be used as a substitute for gravel bags in low-flow situations. Biofilter bags should conform to specifications detailed in SE-14, Biofilter bags.

  1. Construct in a gently sloping area.
  2. Biofilter bags should be placed around inlets to intercept runoff flows.
  3. All bag joints should overlap by 6 in.
  4. Leave room upstream for water to pond and for sediment to settle out.
  5. Stake bags to the ground as described in the following detail. Stakes may be omitted if bags are placed on a paved surface.

Costs

- Average annual cost for installation and maintenance of DI Type 1-4 and 6 (one year useful life) is $200 per inlet.
- Temporary geotextile inserts are proprietary and cost varies by region. These inserts can often be reused and may have greater than 1 year of use if maintained and kept undamaged. Average cost per insert ranges from $50-75 plus installation, but costs can exceed $100. This cost does not include maintenance.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Silt Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.
- Gravel Filters. If the gravel becomes clogged with sediment, it should be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Inspect and maintain temporary geotextile insert devices according to manufacturer's specifications.
- Remove storm drain inlet protection once the drainage area is stabilized.

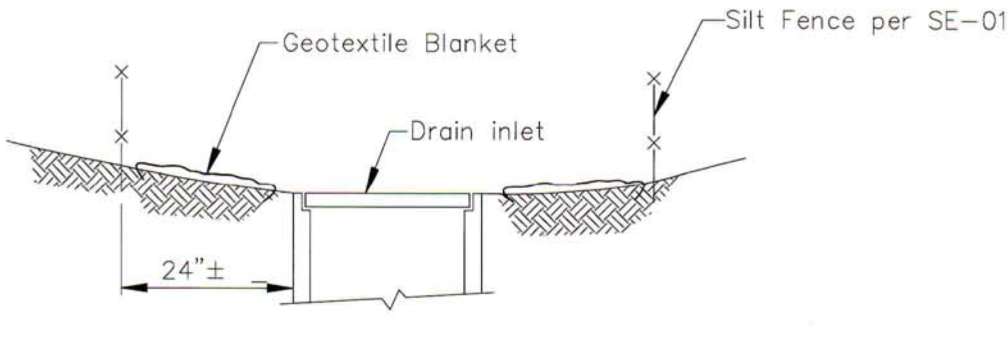
- Clean and regrade area around the inlet and clean the inside of the storm drain inlet, as it should be free of sediment and debris at the time of final inspection.

References

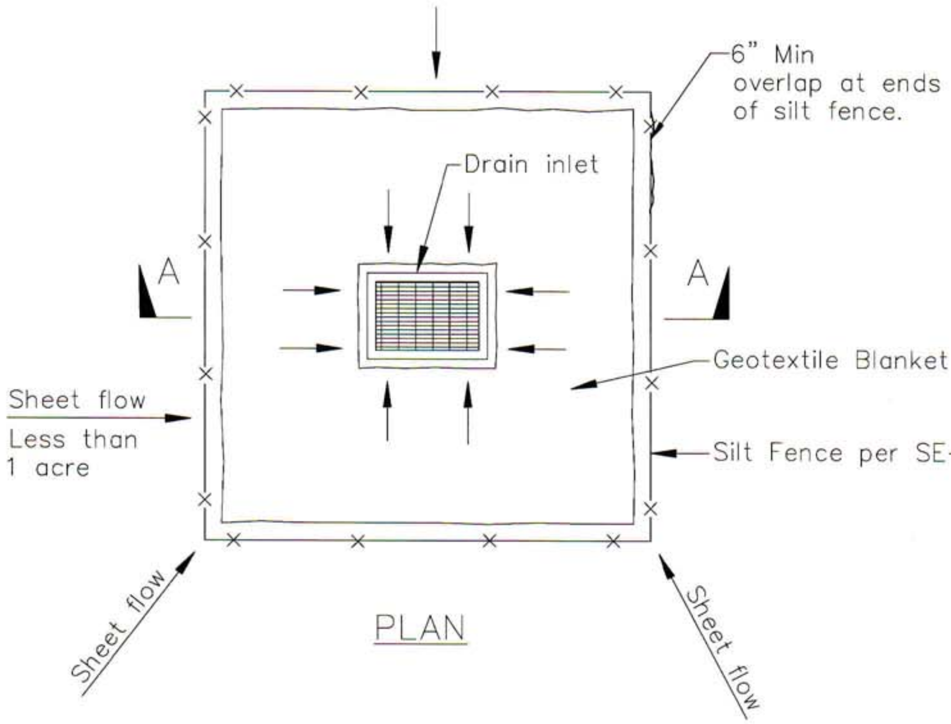
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



SECTION A–A

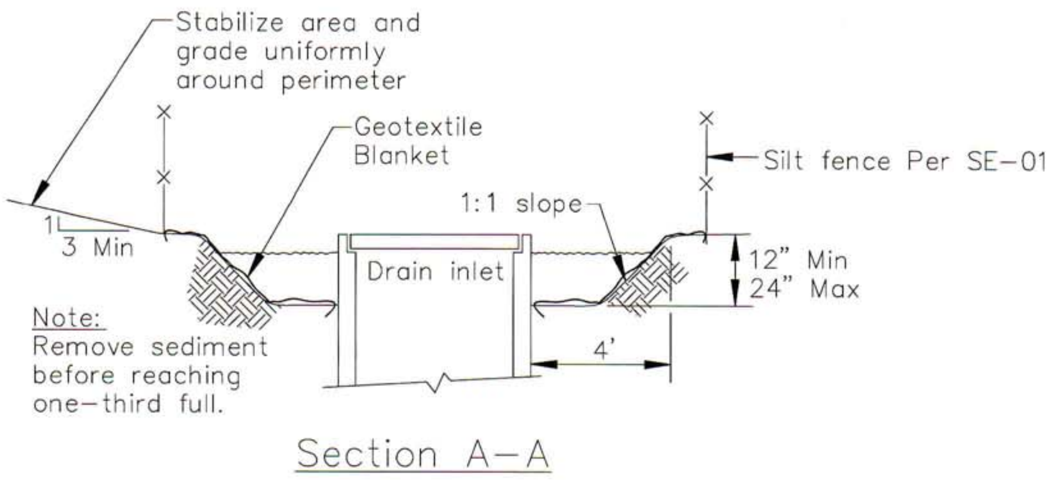


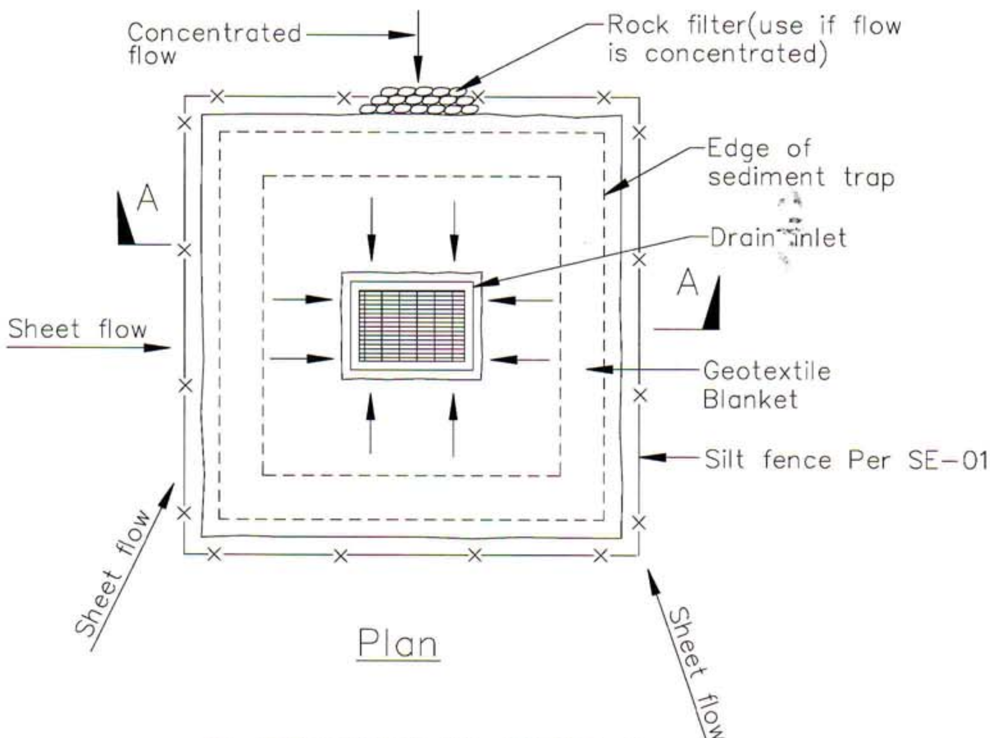
PLAN

DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

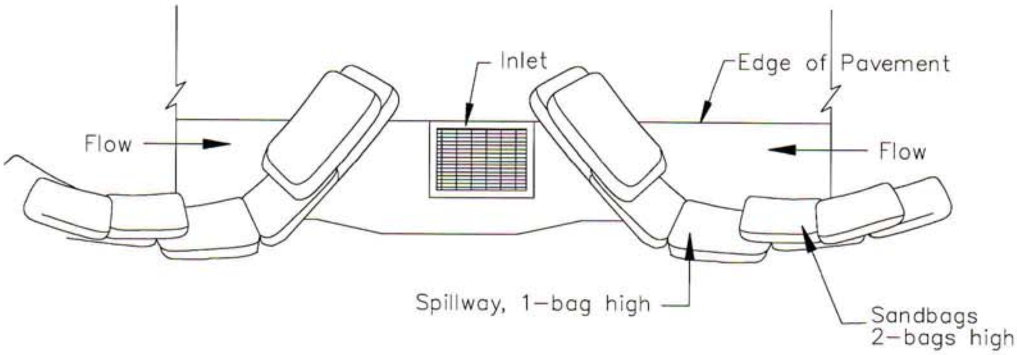
1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



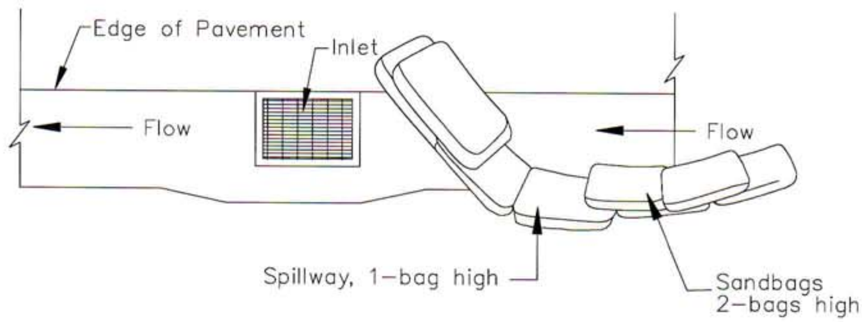


DI PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP

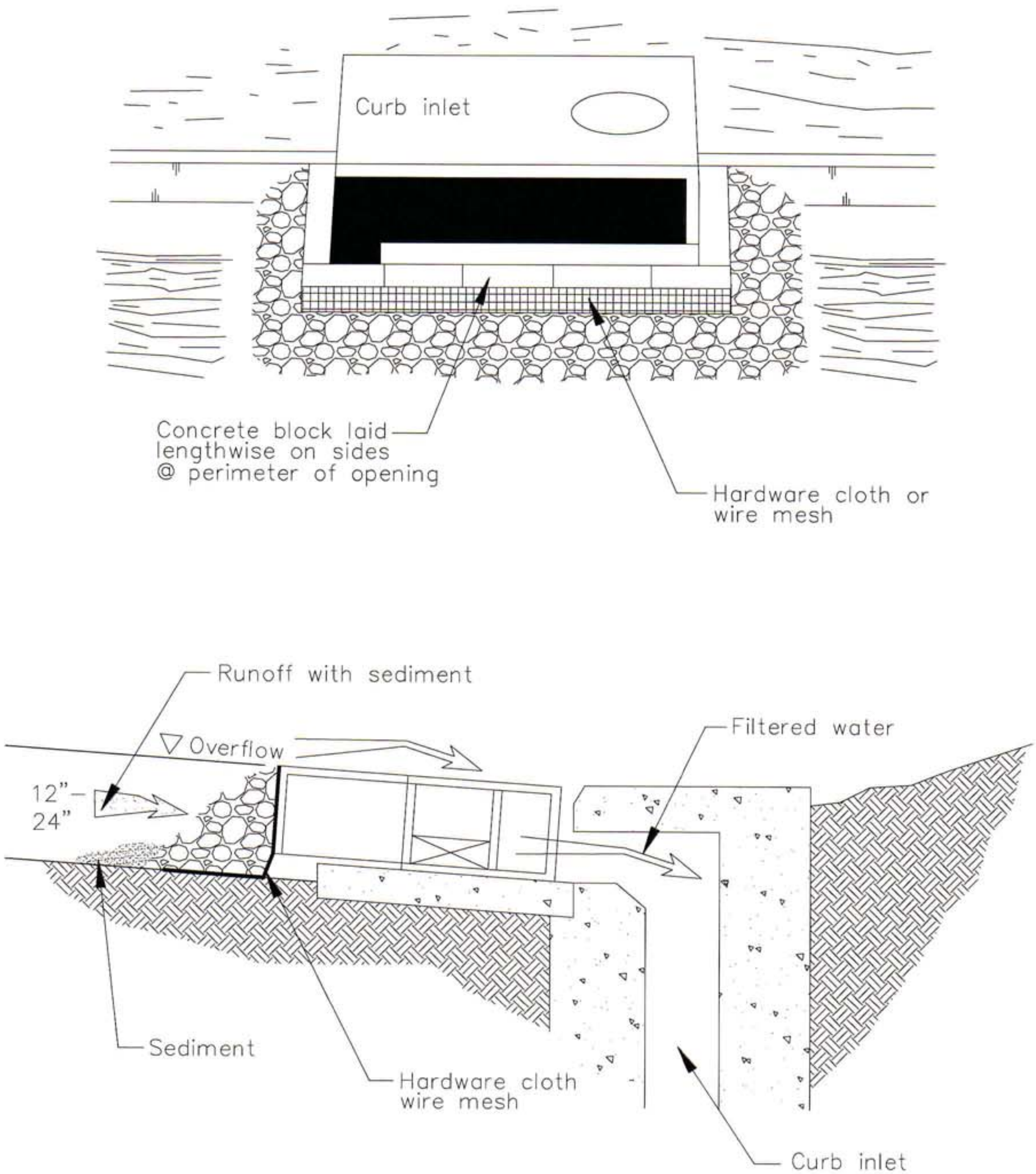


TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.

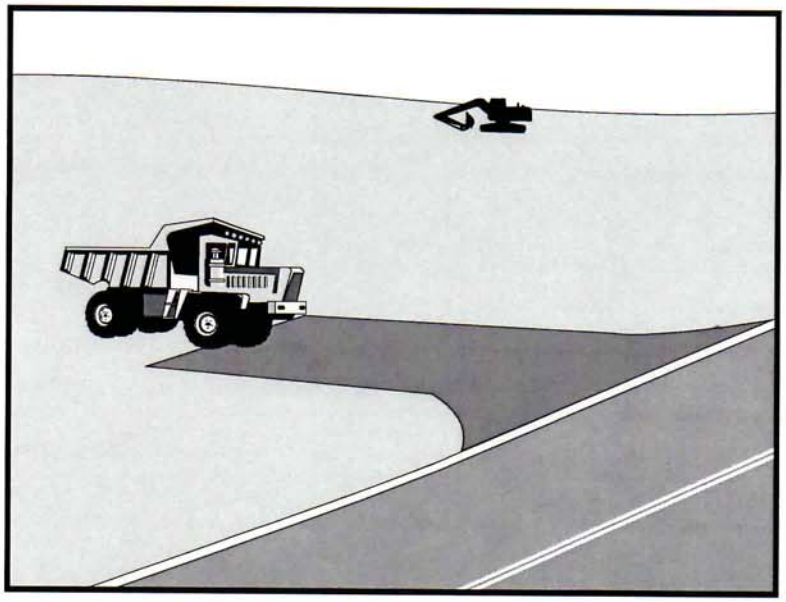
DI PROTECTION TYPE 3
NOT TO SCALE



DI PROTECTION – TYPE 4

NOT TO SCALE

Stabilized Construction Entrance/Exit TC-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A stabilized construction access is defined by a 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.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water

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runoff.

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft minimum, and 30 ft minimum width.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

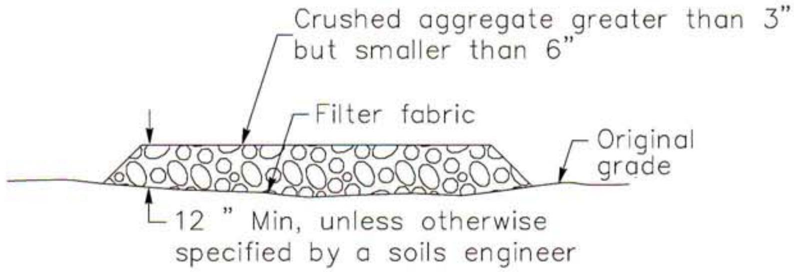
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



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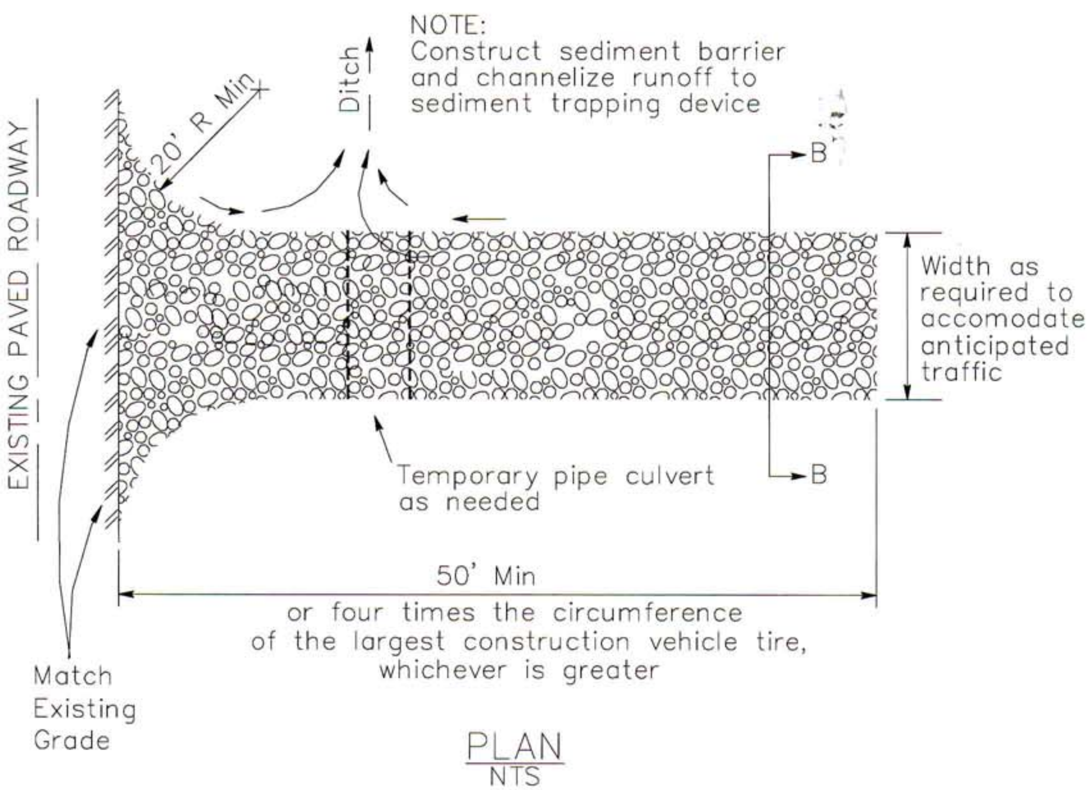
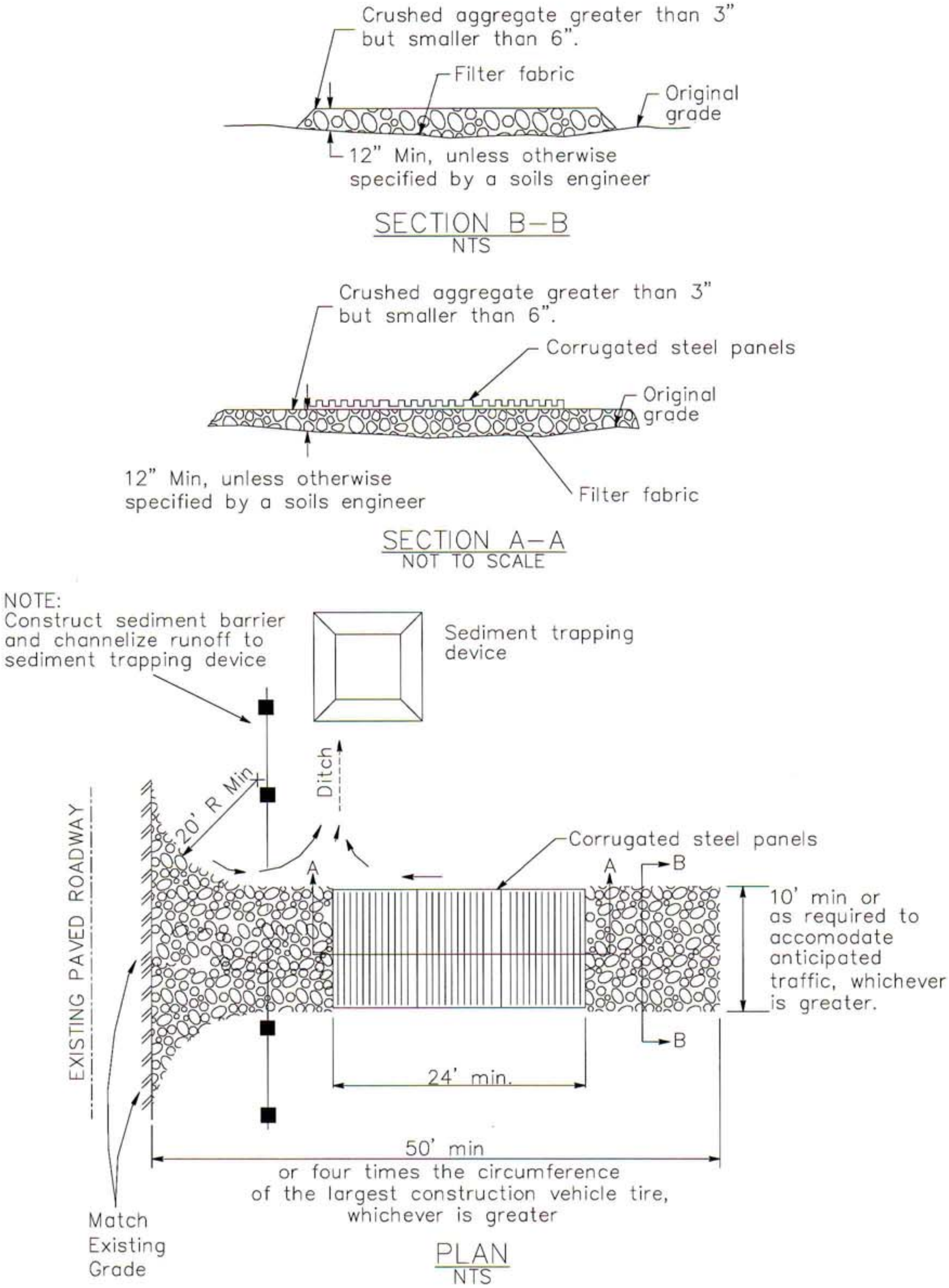
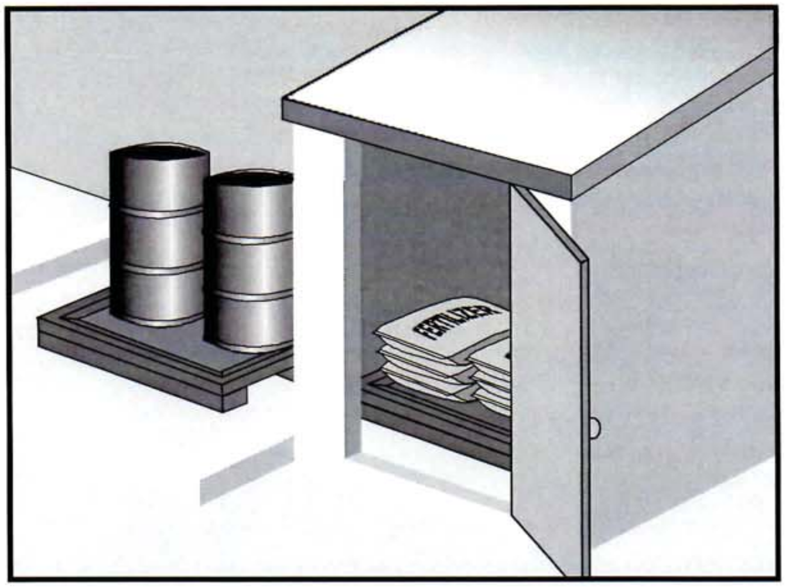


PLAN
NTS



Crushed aggregate greater than 3" but smaller than 6".
Filter fabric
Original grade
12" Min, unless otherwise specified by a soils engineer
SECTION B–B
NTS
Crushed aggregate greater than 3" but smaller than 6".
Corrugated steel panels
Original grade
12" Min, unless otherwise specified by a soils engineer
Filter fabric
SECTION A–A
NOT TO SCALE
NOTE:
Construct sediment barrier and channelize runoff to sediment trapping device
Sediment trapping device
Ditch
20' R Min
EXISTING PAVED ROADWAY
Corrugated steel panels
A
A
B
B
10' min or as required to accomodate anticipated traffic, whichever is greater.
24' min.
50' min
or four times the circumference of the largest construction vehicle tire, whichever is greater
Match Existing Grade
PLAN
NTS

Material Delivery and Storage WM-1



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
  - Avoid transport near drainage paths or waterways.
  - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
  - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 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.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.

- Stockpiles should be protected in accordance with WM-3, Stockpile Management.

- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.

- Proper storage instructions should be posted at all times in an open and conspicuous location.

- An ample supply of appropriate spill clean up material should be kept near storage areas.

- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.

- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.

- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.

- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.

- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Keep storage areas clean and well organized, including a current list of all materials onsite.

- Inspect labels on containers for legibility and accuracy.

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

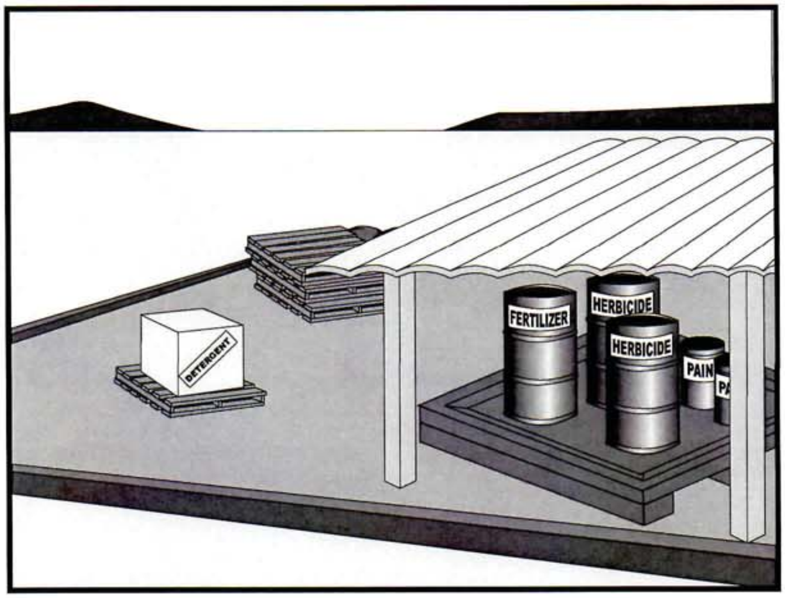
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Material Use

WM-2



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

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Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
  - Do not treat soil that is water-saturated or frozen.
  - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
  - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
  - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
  - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
  - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
  - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
  - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated 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 onsite when practical.
- Document the location, time, chemicals applied, and applicator's name and qualifications.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

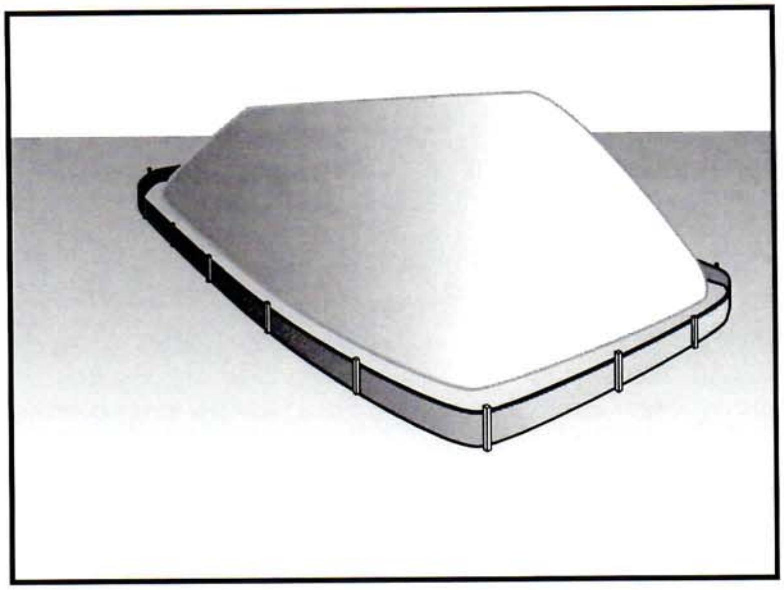
Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP–2005–0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006.Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stockpile Management

WM-3



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of Plastic materials and photodegradable plastics should be avoided.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

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- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.
- All stockpiles are required to be protected immediately if they are not scheduled to be used within 14 days.
- Protect all stockpiles from stormwater runon using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Ensure that stockpile coverings are installed securely to protect from wind and rain.
- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- Soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Temporary vegetation should be considered for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Stockpiles should be covered and protected with a temporary perimeter sediment barrier at all times.

Stockpiles of "cold mix"

- Cold mix stockpiles should be placed on and covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Stockpiles of fly ash, stucco, hydrated lime

- Stockpiles of materials that may raise the pH of runoff (i.e., basic materials) should be covered with plastic and surrounded by a berm.

Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate

- Treated wood should be covered with plastic sheeting or comparable material at all times and surrounded by a berm.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.
- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

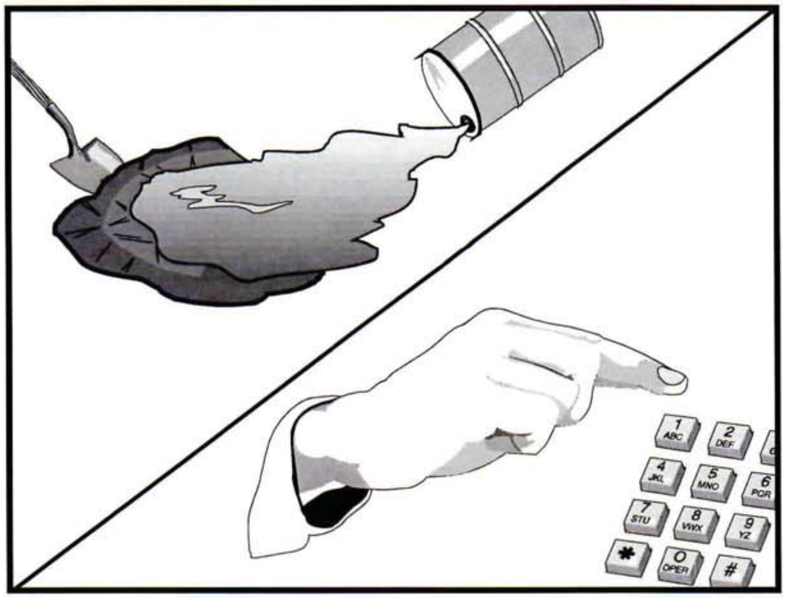
Inspection and Maintenance

- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Spill Prevention and Control WM-4



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
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WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

References

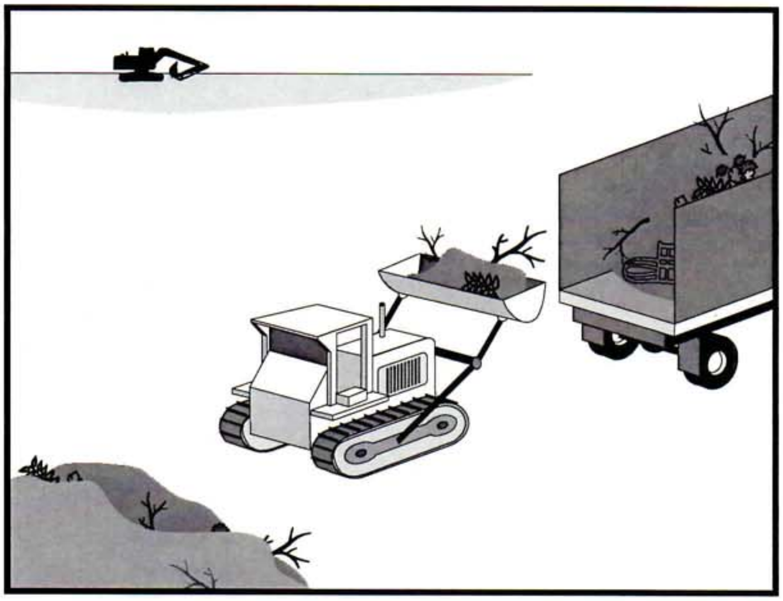
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Solid Waste Management

WM-5



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials
- Highway planting wastes, including vegetative material,

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plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should 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 should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runon should 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 should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.

- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur

- Inspect construction waste area regularly.

- Arrange for regular waste collection.

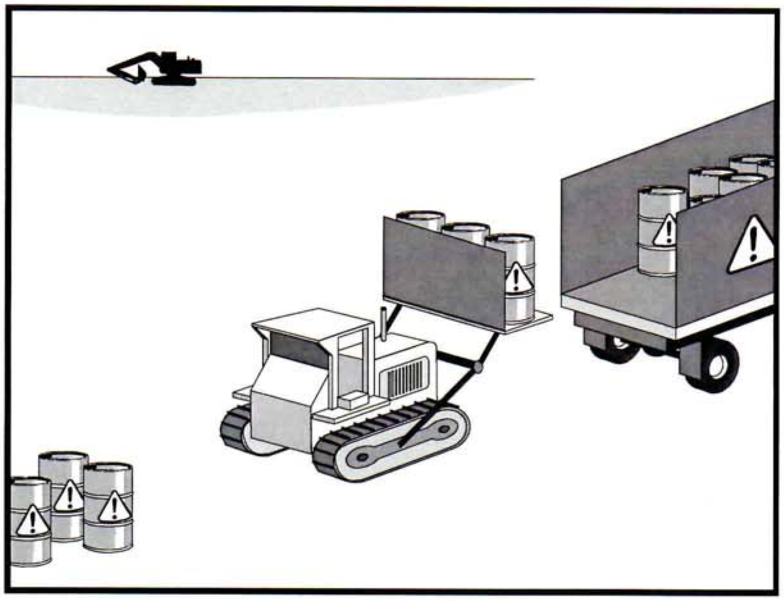
References

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Hazardous Waste Management WM-6



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Asphalt Products
- Concrete Curing Compounds
- Pesticides
- Palliatives
- Acids
- Septic Wastes
- Paints
- Stains
- Solvents
- Wood Preservatives
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

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In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.

- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.

- Drums should not be overfilled and wastes should not be mixed.

- Unless watertight, containers of dry waste should be stored on pallets.

- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.

- Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.

- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.

- The following actions should be taken with respect to temporary contaminant:

  - Ensure that adequate hazardous waste storage volume is available.

  - Ensure that hazardous waste collection containers are conveniently located.

  - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.

  - Minimize production or generation of hazardous materials and hazardous waste on the job site.

  - Use containment berms in fueling and maintenance areas and where the potential for spills is high.

  - Segregate potentially hazardous waste from non-hazardous construction site debris.

  - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should 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 should be repaired or replaced as needed to maintain proper function.
- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.

- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.
- A copy of the hazardous waste manifests should be provided.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

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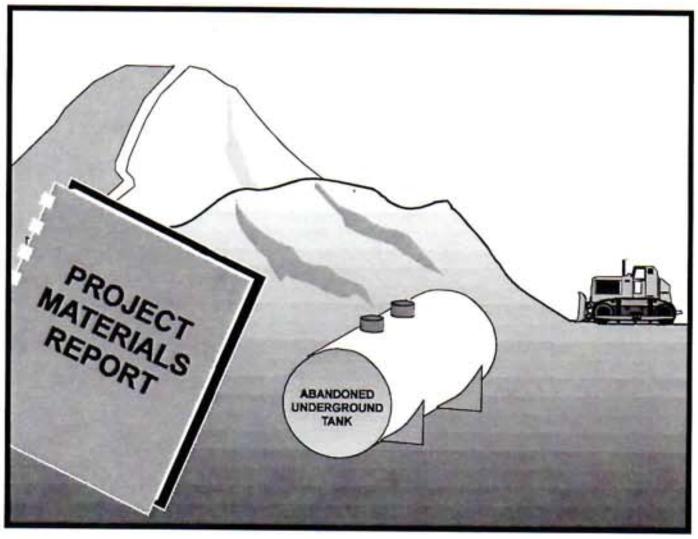

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

Suitable Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, aerial deposition, past use and leaks from underground storage tanks.

Limitations

Contaminated soils that cannot be treated onsite must be disposed of offsite by a licensed hazardous waste hauler. The presence of contaminated soil may indicate contaminated water as well. See NS-2, Dewatering Operations, for more information.

The procedures and practices presented in this BMP are general. The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered onsite.

Implementation

Most owners and developers conduct pre-construction environmental assessments as a matter of routine. Contaminated soils are often identified during project planning and development with known locations identified in the plans, specifications and in the SWPPP. The contractor should review applicable reports and investigate appropriate call-outs in the

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plans, specifications, and SWPPP. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is completed before earth moving begins.

The following steps will help reduce stormwater pollution from contaminated soil:

- Conduct thorough, pre-construction inspections of the site and review documents related to the site. If inspection or reviews indicated presence of contaminated soils, develop a plan before starting work.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
- Prevent leaks and spills. Contaminated soil can be expensive to treat and dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.
- The contractor may further identify contaminated soils by investigating:
  - Past site uses and activities
  - Detected or undetected spills and leaks
  - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements
  - Contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
  - Suspected soils should be tested at a certified laboratory.

Education

- Have employees and subcontractors complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified, prior to performing any excavation work at the locations containing material classified as hazardous.
- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.
- Excavation, transportation, and placement operations should result in no visible dust.
- Caution should be exercised to prevent spillage of lead containing material during transport.

- Quality should be monitored during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Minimize onsite storage. Contaminated soil should be disposed of properly in accordance with all applicable regulations. All hazardous waste storage will comply with the requirements in Title 22, CCR, Sections 66265.250 to 66265.260.

- Test suspected soils at an approved certified laboratory.

- Work with the local regulatory agencies to develop options for treatment or disposal if the soil is contaminated.

- Avoid temporary stockpiling of contaminated soils or hazardous material.

- Take the following precautions if temporary stockpiling is necessary:

  - Cover the stockpile with plastic sheeting or tarps.

  - Install a berm around the stockpile to prevent runoff from leaving the area.

  - Do not stockpile in or near storm drains or watercourses.

- Remove contaminated material and hazardous material on exteriors of transport vehicles and place either into the current transport vehicle or into 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 treat or dispose of it at an appropriate disposal site.

- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.

- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.

- Excavate, transport, and dispose of contaminated material and hazardous material 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)
- Local regulatory agencies

Procedures for Underground Storage Tank Removals

- Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies that have jurisdiction over such work.
- To determine if it contains hazardous substances, arrange to have tested, any liquid or sludge found in the underground tank prior to its removal.
- Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).
- The underground storage tank, any liquid or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal and transported to disposal facilities permitted to accept such waste.

Water Control

- All necessary precautions and preventive measures should be taken to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to, berms, cofferdams, grout curtains, freeze walls, and 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, should be discharged to clean, closed top, watertight transportable holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

Costs

Prevention of leaks and spills is inexpensive. Treatment or disposal of contaminated soil can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Arrange for contractor's Water Pollution Control Manager, foreman, and/or construction supervisor to monitor onsite contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.
- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.

- Implement WM-4, Spill Prevention and Control, to prevent leaks and spills as much as possible.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

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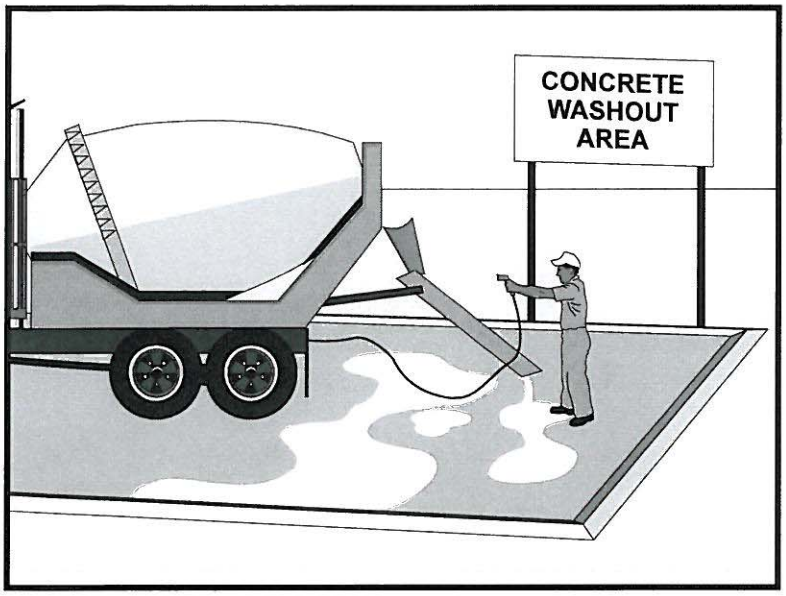
Concrete Waste Management WM-8



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Prevent the discharge of pollutants to stormwater from concrete waste by conducting washout onsite or offsite in a designated area, and by employee and subcontractor training.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials, including mortar, concrete, stucco, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows and raising pH to levels outside the accepted range.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing portland cement concrete (PCC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.

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- Concrete trucks and other concrete-coated equipment are washed onsite.
- Mortar-mixing stations exist.
- Stucco mixing and spraying .
- See also NS-8, Vehicle and Equipment Cleaning.

Limitations

- Offsite washout of concrete wastes may not always be possible.
- Multiple washouts may be needed to assure adequate capacity and to allow for evaporation.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas. Refer to WM-1, Material Delivery and Storage for more information.
- Avoid mixing excess amounts of concrete.
- Perform washout of concrete trucks in designated areas only, where washout will not reach stormwater.
- Do not wash out concrete trucks into storm drains, open ditches, streets, streams or onto the ground. Trucks should always be washed out into designated facilities.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
  - On larger sites, it is recommended to locate washout areas at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
  - Washout wastes into the temporary washout where the concrete can set, be broken up, and then disposed properly.
  - Washout should be lined so there is no discharge into the underlying soil.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.
- See typical concrete washout installation details at the end of this fact sheet.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.

- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.

- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.

Concrete Demolition Wastes

- Stockpile concrete demolition waste in accordance with BMP WM-3, Stockpile Management.

- Dispose of or recycle hardened concrete waste in accordance with applicable federal, state or local regulations.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.

- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below).

- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.

- Saw-cut concrete slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine or by sweeping. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.

- Concrete slurry residue should be disposed in a temporary washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.

- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.

- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Temporary washout facilities should be lined to prevent discharge to the underlying ground or surrounding area.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of or recycled offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of or recycle hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft; however, smaller sites or jobs may only need a smaller washout facility. With any washout, always maintain a sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
  - Materials used to construct the washout area should conform to the provisions detailed in their respective BMPs (e.g., SE-8 Sandbag Barrier).
  - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
  - Alternatively, portable removable containers can be used as above grade concrete washouts. Also called a "roll-off"; this concrete washout facility should be properly sealed to prevent leakage, and should be removed from the site and replaced when the container reaches 75% capacity.
- Temporary Concrete Washout Facility (Type Below Grade)
  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
  - Lath and flagging should be commercial type.
  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

- The base of a washout facility should be free of rock or debris that may damage a plastic liner.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and properly disposed or recycled in accordance with federal, state or local regulations. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and properly disposed or recycled in accordance with federal, state or local regulations..

- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures. Roll-off concrete washout facilities can be more costly than other measures due to removal and replacement; however, provide a cleaner alternative to traditional washouts. The type of washout facility, size, and availability of materials will determine the cost of the washout.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and properly disposed or recycled in accordance with federal, state or local regulations.

- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

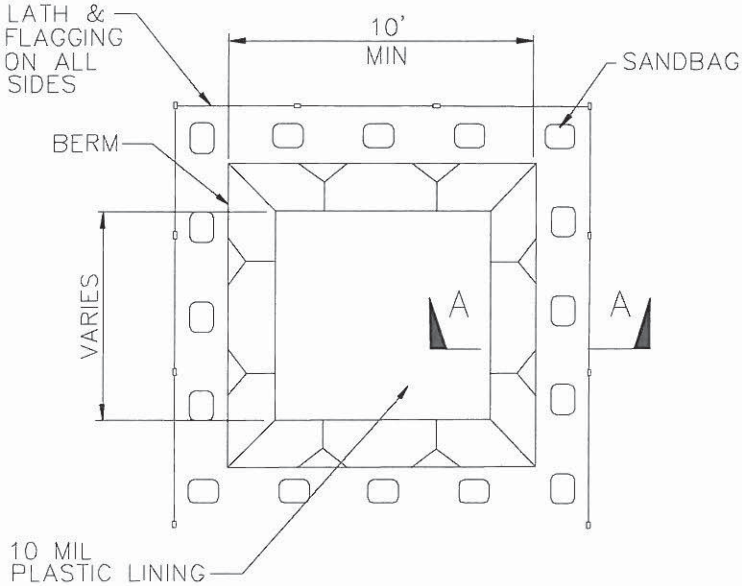
- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

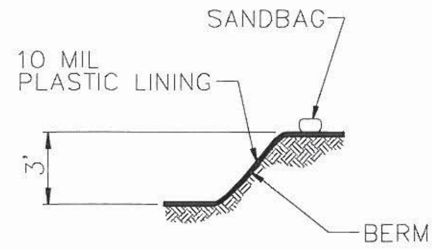
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

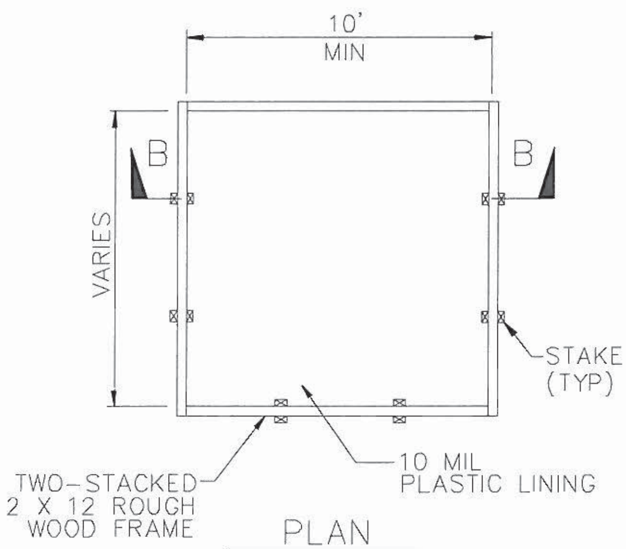
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



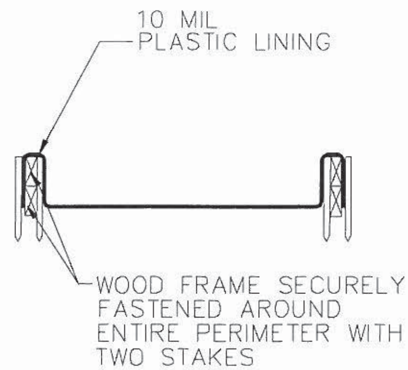
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A–A
NOT TO SCALE



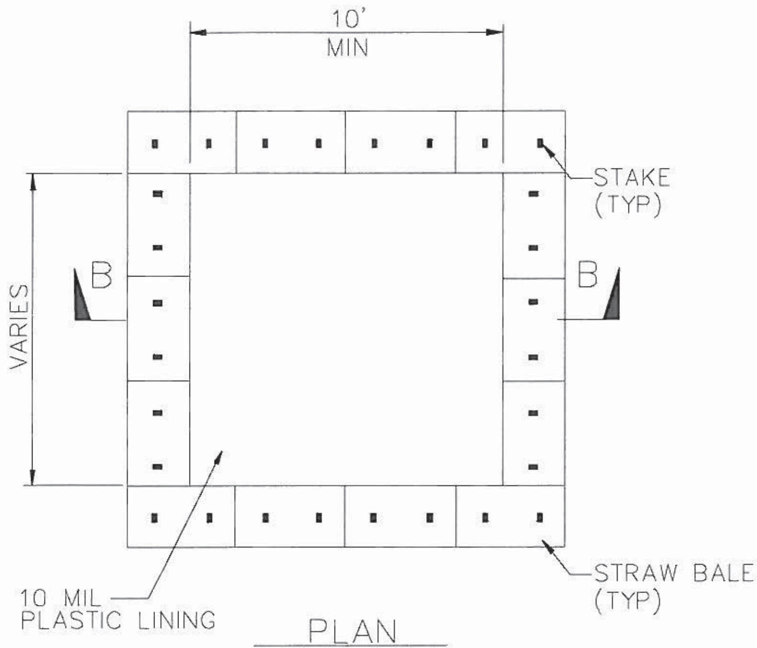
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



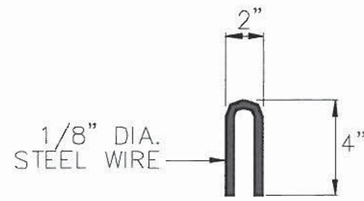
SECTION B–B
NOT TO SCALE

NOTES

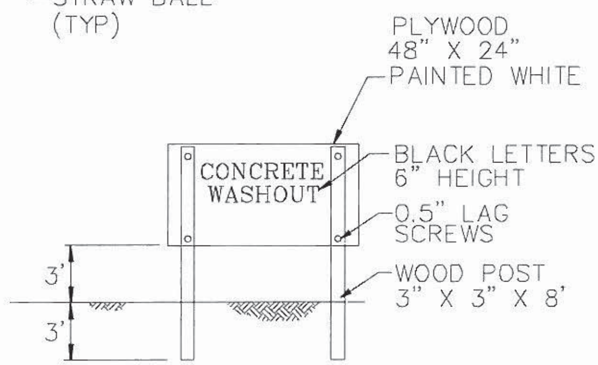
1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



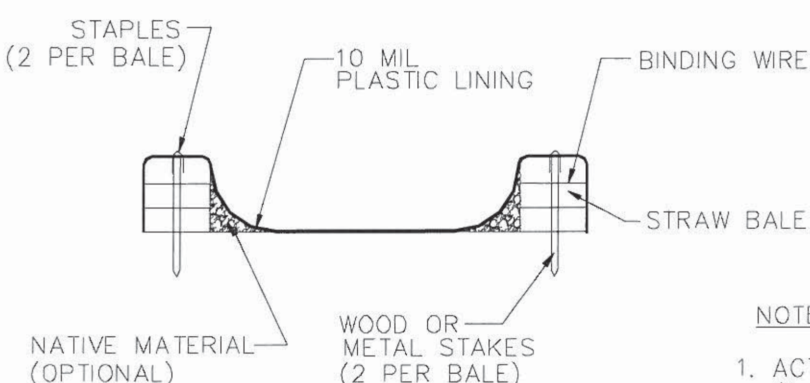
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"
WITH STRAW BALES



STAPLE DETAIL



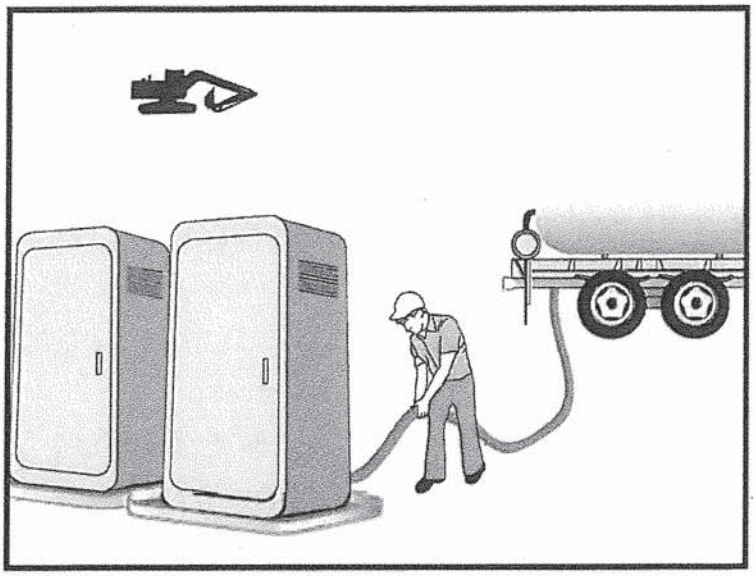
CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)



SECTION B–B
NOT TO SCALE

NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	☑
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

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- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

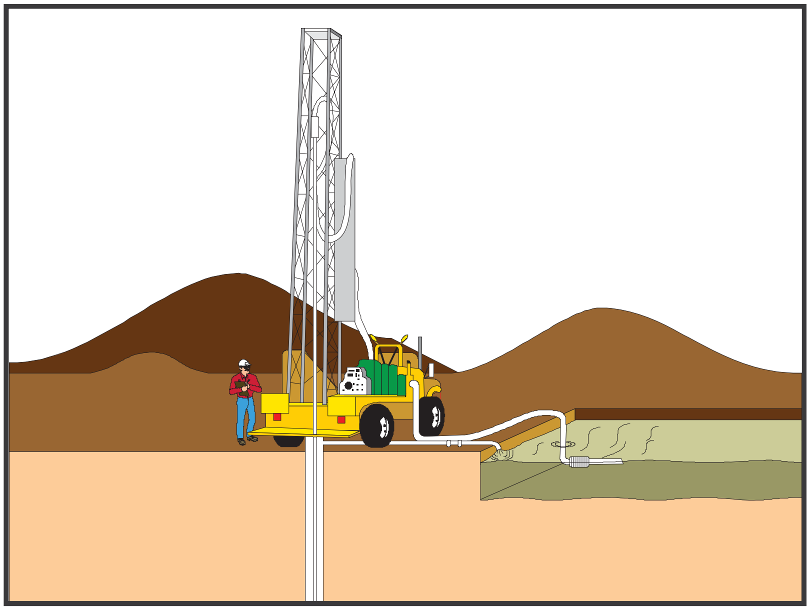
Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

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Description and Purpose

Liquid waste management includes procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

Suitable Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous by-products, residuals, or wastes:

- Drilling slurries and drilling fluids
- Grease-free and oil-free wastewater and rinse water
- Dredgings
- Other non-stormwater liquid discharges not permitted by separate permits

Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, Coastal Commission permits, etc.).
- Liquid waste management does not apply to dewatering operations (NS-2 Dewatering Operations), solid waste management (WM-5, Solid Waste Management), hazardous wastes (WM-6, Hazardous Waste Management), or

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concrete slurry residue (WM-8, Concrete Waste Management).

- Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and discharges or flows from emergency fire fighting activities.

Implementation

General Practices

- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.
- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.
- Educate employees and subcontractors on liquid waste generating activities and liquid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Verify which non-stormwater discharges are permitted by the statewide NPDES permit; different regions might have different requirements not outlined in this permit.
- Apply NS-8, Vehicle and Equipment Cleaning for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

- Drilling residue and drilling fluids should not be allowed to enter storm drains and watercourses and should be disposed of.
- If an appropriate location is available, drilling residue and drilling fluids that are exempt under Title 23, CCR § 2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in WM-8, Concrete Waste Management.
- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, should be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.
- Liquid wastes should be contained in a controlled area such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.
- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

- Precautions should be taken to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in WM-4, Spill Prevention and Control.

- Containment areas or devices should not be located where accidental release of the contained liquid can threaten health or safety or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes that have the potential to affect the storm drainage system (such as wash water and rinse water from cleaning walls or pavement), before they run off a surface.

- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.

- Use a sediment trap (SE-3, Sediment Trap) for capturing and treating sediment laden liquid waste or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- A typical method to handle liquid waste is to dewater the contained liquid waste, using procedures such as described in NS-2, Dewatering Operations, and SE-2, Sediment Basin, and dispose of resulting solids per WM-5, Solid Waste Management.

- Methods of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, and local agency discharge permits, etc. Review the SWPPP to see if disposal methods are identified.

- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management.

- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Costs

Prevention costs for liquid waste management are minimal. Costs increase if cleanup or fines are involved.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

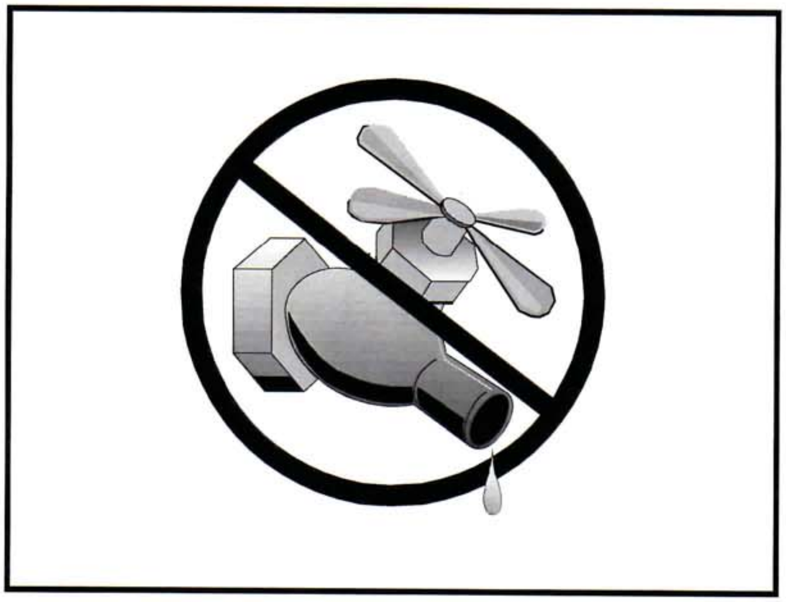
- Remove deposited solids in containment areas and capturing devices as needed and at the completion of the task. Dispose of any solids as described in WM-5, Solid Waste Management.

- Inspect containment areas and capturing devices and repair as needed.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Water Conservation Practices



Categories		
EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.
- Direct construction water runoff to areas where it can soak

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into the ground or be collected and reused.

- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.

- Lock water tank valves to prevent unauthorized use.

Costs
The cost is small to none compared to the benefits of conserving water.

Inspection and Maintenance
- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occuring.

- Repair water equipment as needed to prevent unintended discharges.

  - Water trucks

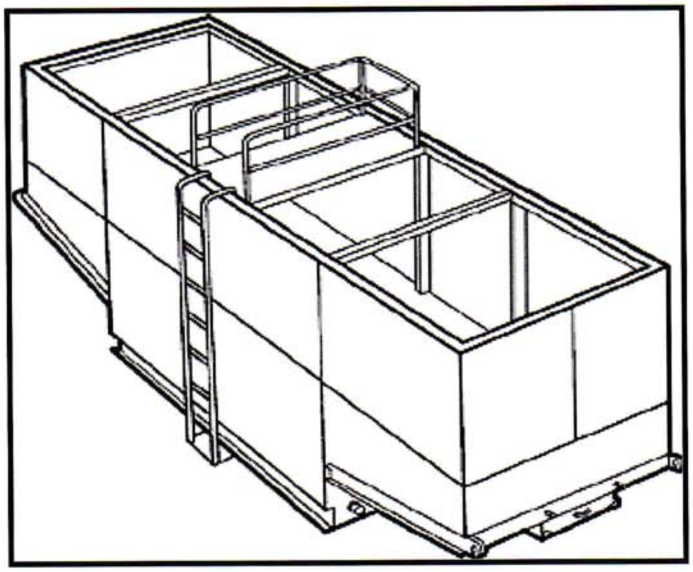
  - Water reservoirs (water buffalos)

  - Irrigation systems

  - Hydrant connections

References
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Dewatering Operations NS-2



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

SE-5: Fiber Roll

SE-6: Gravel Bag Berm

Description and Purpose

Dewatering operations are practices that manage the discharge of pollutants when non-stormwater and accumulated precipitation (stormwater) must be removed from a work location to proceed with construction work or to provide vector control.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Discharges from dewatering operations can contain high levels of fine sediment that, if not properly treated, could lead to exceedences of the General Permit requirements.

Suitable Applications

These practices are implemented for discharges of non-stormwater from construction sites. Non-stormwaters 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 to facilitate construction.

Practices identified in this section are also appropriate for implementation when managing the removal of accumulated precipitation (stormwater) from depressed areas at a construction site.

Stormwater mixed with non-stormwater should be managed as non-stormwater.

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Limitations

- Dewatering operations will require, and should comply with applicable local and project-specific permits and regulations. In some areas, all dewatering activities, regardless of the discharge volume, require a dewatering permit.
- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this fact sheet primarily address sediment. Other secondary pollutant removal benefits are discussed where applicable.
- The controls detailed in this fact sheet only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.
- Avoid dewatering discharges where possible by using the water for dust control.

Implementation

- A Construction Site Monitoring Plan (CSMP) should be included in the project Stormwater Pollution Prevention Plan (SWPPP).
- Regional Water Quality Control Board (RWQCB) Regions may require notification and approval prior to any discharge of water from construction sites.
- The destination of discharge from dewatering activities will typically determine the type of permit required by the discharger. For example, when discharging to a water of the U.S., a groundwater extraction permit will be required through the site's governing RWQCB. When discharging to a sanitary sewer or Municipal Separate Storm Sewer System (MS4), a permit may need to be obtained through the owner of the sanitary sewer or MS4 in addition to obtaining an RWQCB dewatering permit. Additional permits or permissions from other agencies may be required for dewatering cofferdams or diversions.
- Dewatering discharges should not cause erosion at the discharge point. Appropriate BMPs should be implemented to maintain compliance with all applicable permits.
- Maintain dewatering records in accordance with all local and project-specific permits and regulations.

Sediment Treatment

A variety of methods can be used to treat water during dewatering operations. Several devices are presented below and provide options to achieve sediment removal. The sediment particle size and permit or receiving water limitations on sediment are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate. Use of other enhanced treatment methods (i.e., introduction of chemicals or electric current to enhance flocculation and removal of sediment) must comply with: 1) for storm drain or surface water discharges, the requirements for Active Treatment Systems (SE-11); or 2) for sanitary sewer discharges, the requirements of applicable sanitary sewer discharge permits.

Sediment Basin (see also SE-2)

Description:

- A sediment basin is a temporary basin with a controlled release structure that is formed by excavation or construction of an embankment to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment basins are generally larger than Sediment Traps (SE-3) and have a designed outlet structure.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, silt, some metals that settle out with the sediment.

Implementation:

- Excavation and construction of related facilities is required.
- Temporary sediment basins should be fenced if safety is a concern.
- Outlet protection is required to prevent erosion at the outfall location.

Maintenance:

- Maintenance is required for safety fencing, vegetation, embankment, inlet and outlet, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Sediment Trap (See also SE-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. Sediment traps are generally smaller than Sediment Basins (SE-2) and do not have a designed outlet (but do have a spillway or overflow).

Appropriate Applications:

Effective for the removal of large and medium sized particles (sand and gravel) and some metals that settle out with the sediment.

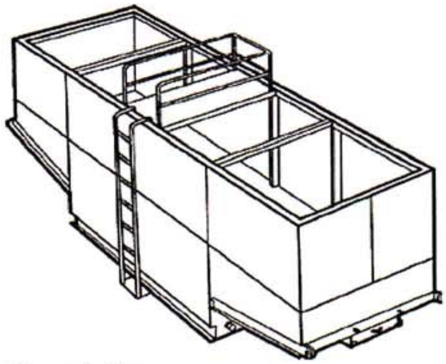
Implementation:

- Excavation and construction of related facilities is required.
- Trap inlets should 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.

Weir Tanks



Description:

- A weir tank separates water and waste by using weirs. The configuration of the weirs (over and under weirs) maximizes the residence time in the tank and determines the waste to be removed from the water, such as oil, grease, and sediments.

Appropriate Applications:

- The tank removes trash, some settleable solids (gravel, sand, and silt), some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.

- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.

- Treatment capacity (i.e., volume and number of tanks) should provide at a minimum the required volume for discrete particle settling for treatment design flows.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.

- Oil and grease disposal should be conducted by a licensed waste disposal company.

Dewatering Tanks

Description:

- A dewatering tank removes debris and sediment. Flow enters the tank through the top, passes through a fabric filter, and is discharged through the bottom of the tank. The filter separates the solids from the liquids.

Appropriate Applications:

- The tank removes trash, gravel, sand, and silt, some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.

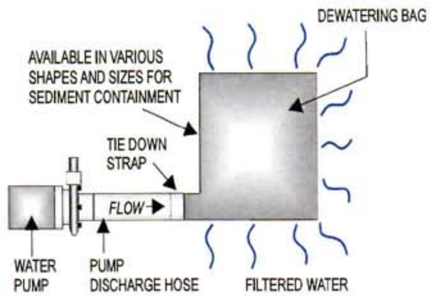
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.

- Oil and grease disposal should be conducted by licensed waste disposal company.

Gravity Bag Filter



Description:

- A gravity bag filter, also referred to as a dewatering bag, is a square or rectangular bag made of non-woven geotextile fabric that collects gravel, sand, silt, and fines.

Appropriate Applications:

- Effective for the removal of sediments (gravel, sand, silt, and fines). Some metals are removed with the sediment.

Implementation:

- Water is pumped into one side of the bag and seeps through the top, bottom, and sides of the bag.

- Place filter bag on pavement or a gravel bed or paved surface. Avoid placing a dewatering bag on unprotected bare soil. If placing the bag on bare soil is unavoidable, a secondary barrier should be used, such as a rock filter bed placed beneath and beyond the edges of the bag to, prevent erosion and capture sediments that escape the bag.

- Perimeter control around the downstream end of the bag should be implemented. Secondary sediment controls are important especially in the initial stages of discharge, which tend to allow fines to pass through the bag.

Maintenance:

- Inspection of the flow conditions, bag condition, bag capacity, and the secondary barrier (as applicable) is required.

- Replace the bag when it no longer filters sediment or passes water at a reasonable rate.

- Caution should be taken when removing and disposing of the bag, to prevent the release of captured sediment

- Properly dispose of the bag offsite. If sediment is removed from the bag prior to disposal (bags can potentially be reused depending upon their condition), dispose of sediment in accordance with the general maintenance procedures described at the end of this BMP Fact Sheet.

Sand Media Particulate Filter

Description:

- Water is treated by passing it through canisters filled with sand media. Generally, sand filters provide a final level of treatment. They are often used as a secondary or higher level of treatment after a significant amount of sediment and other pollutants have been removed using other methods.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, and silt and some metals, as well as the reduction of biochemical oxygen demand (BOD) and turbidity.
- Sand filters can be used for stand-alone treatment or in conjunction with bag and cartridge filtration if further treatment is required.
- Sand filters can also be used to provide additional treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filters require regular service to monitor and maintain the level of the sand media. If subjected to high loading rates, filters can plug quickly.
- Venders generally provide data on maximum head loss through the filter. The filter should be monitored daily while in use, and cleaned when head loss reaches target levels.
- If cleaned by backwashing, the backwash water may need to be hauled away for disposal, or returned to the upper end of the treatment train for another pass through the series of dewatering BMPs.

Pressurized Bag Filter

Description:

- A pressurized bag filter is a unit composed of single filter bags made from polyester felt material. The water filters through the unit and is discharged through a header. Vendors provide bag filters in a variety of configurations. Some units include a combination of bag filters and cartridge filters for enhanced contaminant removal.

Appropriate Applications:

- Effective for the removal of sediment (sand and silt) and some metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Oil absorbent bags are available for hydrocarbon removal.
- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filter bags require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Cartridge Filter

Description:

- Cartridge filters provide a high degree of pollutant removal by utilizing a number of individual cartridges as part of a larger filtering unit. They are often used as a secondary or higher (polishing) level of treatment after a significant amount of sediment and other pollutants are removed. Units come with various cartridge configurations (for use in series with bag filters) or with a larger single cartridge filtration unit (with multiple filters within).

Appropriate Applications:

- Effective for the removal of sediment (sand, silt, and some clays) and metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Hydrocarbons can effectively be removed with special resin cartridges.

- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance.

Maintenance:

- The cartridges require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Costs

- Sediment control costs vary considerably depending on the dewatering and sediment treatment system that is selected. Pressurized filters tend to be more expensive than gravity settling, but are often more effective. Simple tanks are generally rented on a long-term basis (one or more months) and can range from $360 per month for a 1,000 gallon tank to $2,660 per month for a 10,000 gallon tank. Mobilization and demobilization costs vary considerably.

Inspection and Maintenance

- Inspect and verify that dewatering BMPs are in place and functioning prior to the commencement of activities requiring dewatering.

- Inspect dewatering BMPs daily while dewatering activities are being conducted.

- Inspect all equipment before use. Monitor dewatering operations to ensure they do not cause offsite discharge or erosion.
- Sample dewatering discharges as required by the General Permit.
- Unit-specific maintenance requirements are included with the description of each unit.
- Sediment removed during the maintenance of a dewatering device may be either spread onsite and stabilized, or disposed of at a disposal site as approved by the owner.
- Sediment that is commingled with other pollutants should be disposed of in accordance with all applicable laws and regulations and as approved by the owner.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

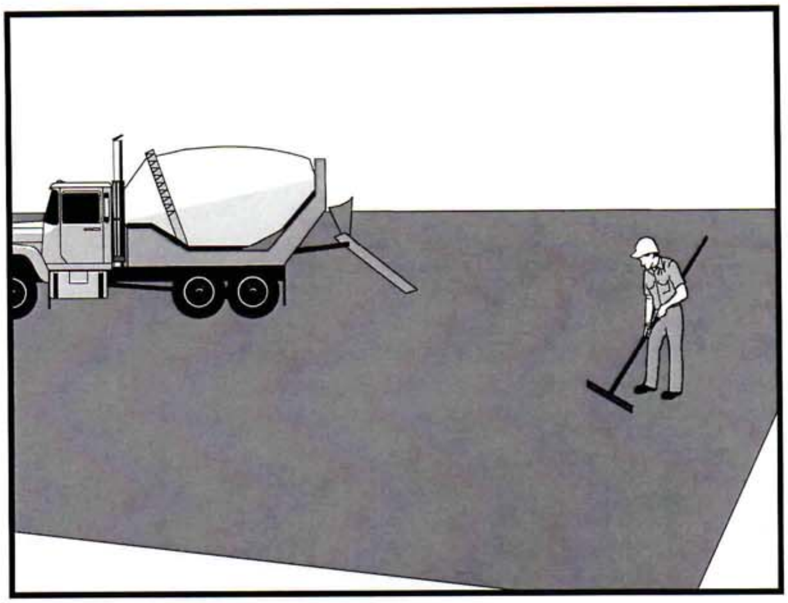
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003; Updated March 2004.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Labor Surcharge & Equipment Rental Rates, April 1, 2002 through March 31, 2003, California Department of Transportation (Caltrans).

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Paving and Grinding Operations NS-3



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☒

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runon and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Paving opportunities may be limited during wet weather.
- Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.

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Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runon (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of)or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:
  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.
  - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).
- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.
- 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.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.
- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.
- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.
- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

References

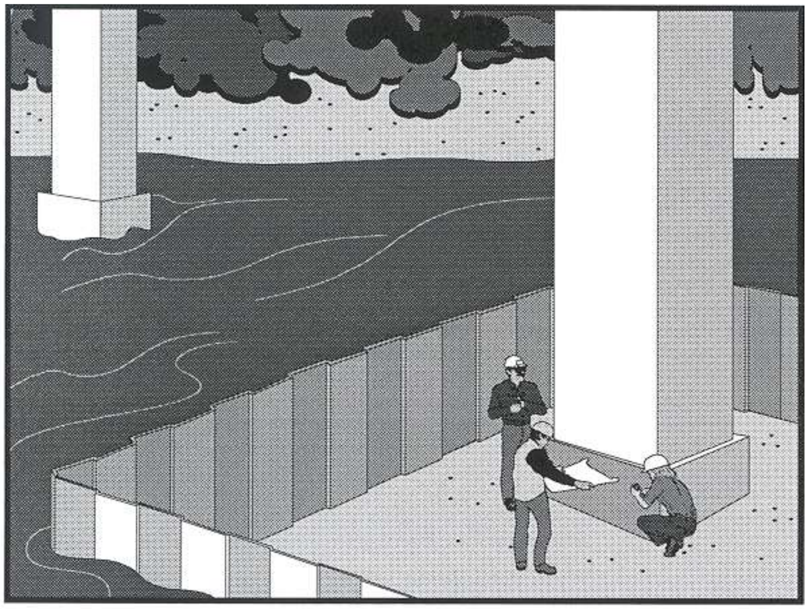
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Clear Water Diversion NS-5



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Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

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Description and Purpose

Clear water diversion consists of a system of structures and measures that intercept clear surface water runoff upstream of a project, transport it around the work area, and discharge it downstream with minimal water quality degradation from either the project construction operations or the construction of the diversion. Clear water diversions are used in a waterway to enclose a construction area and reduce sediment pollution from construction work occurring in or adjacent to water. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains, rock, gravel bags, wood, aqua barriers, cofferdams, filter fabric or turbidity curtains, drainage and interceptor swales, pipes, or flumes.

Suitable Applications

A clear water diversion is typically implemented where appropriate permits (1601 Agreement) have been secured and work must be performed in a flowing stream or water body.

- Clear water diversions are appropriate for isolating construction activities occurring within or near a water body such as streambank stabilization, or culvert, bridge, pier or abutment installation. They may also be used in combination with other methods, such as clear water bypasses and/or pumps.

- Pumped diversions are suitable for intermittent and low flow streams.

- Excavation of a temporary bypass channel, or passing the flow through a heavy pipe (called a "flume") with a trench excavated under it, is appropriate for the diversion of streams less than 20 ft wide, with flow rates less than 100 cfs.

- Clear water diversions incorporating clean washed gravel may be appropriate for use in salmonid spawning streams.

Limitations

- Diversion and encroachment activities will usually disturb the waterway during installation and removal of diversion structures.
- Installation may require 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. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required.
- Diversion and encroachment activities may constrict the waterway, which can obstruct flood flows and cause flooding or washouts. Diversion structures should not be installed without identifying potential impacts to the stream channel.
- Diversion or isolation activities are not appropriate in channels where there is insufficient stream flow to support aquatic species in the area dewatered as a result of the diversion.
- Diversion or isolation activities are inappropriate in deep water unless designed or reviewed by an engineer registered in California.
- Diversion or isolation activities should not completely dam stream flow.
- Dewatering and removal may require additional sediment control or water treatment. See NS-2, Dewatering Operations.
- Not appropriate if installation, maintenance, and removal of the structures will disturb sensitive aquatic species of concern.

Implementation

General

- Implement guidelines presented in NS-17, Streambank Stabilization to minimize impacts to streambanks.
- Where working areas encroach on flowing streams, barriers adequate to prevent the flow of muddy water into streams should be constructed and maintained between working areas and streams. During construction of the barriers, muddying of streams should be held to a minimum.
- Diversion structures must be adequately designed to accommodate fluctuations in water depth or flow volume due to tides, storms, flash floods, etc.
- Heavy equipment driven in wet portions of a water body to accomplish work should be completely clean of petroleum residue, and water levels should be below the fuel tanks, gearboxes, and axles of the equipment unless lubricants and fuels are sealed such that inundation by water will not result in discharges of fuels, oils, greases, or hydraulic fluids.

- Excavation equipment buckets may reach out into the water for the purpose of removing or placing fill materials. Only the bucket of the crane/ excavator/backhoe may operate in a water body. The main body of the crane/excavator/backhoe should not enter the 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, should be positioned over drip pans.
- When any artificial obstruction is being constructed, maintained, or placed in operation, sufficient water should, at all times, be allowed to pass downstream to maintain aquatic life.
- Equipment should not be parked below the high water mark unless allowed by a permit.
- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations. Precautions should be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation should be replaced with the appropriate erosion control measures.
- Riparian vegetation approved for trimming as part of the project should be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation should be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble should be removed upon completion of project activities.
- Drip pans should 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 1 hour.
- Where possible, avoid or minimize diversion and encroachment impacts by scheduling construction during periods of low flow or when the stream is dry. Scheduling should also consider seasonal releases of water from dams, fish migration and spawning seasons, and water demands due to crop irrigation.
- Construct diversion structures with materials free of potential pollutants such as soil, silt, sand, clay, grease, or oil.

Temporary Diversions and Encroachments

- Construct diversion channels in accordance with EC-9, Earth Dikes and Drainage Swales.
- In high flow velocity areas, stabilize slopes of embankments and diversion ditches using an appropriate liner, in accordance with EC-7, Geotextiles and Mats, or use rock slope protection.
- Where appropriate, use natural streambed materials such as large cobbles and boulders for temporary embankment and slope protection, or other temporary soil stabilization methods.
- Provide for velocity dissipation at transitions in the diversion, such as the point where the stream is diverted to the channel and the point where the diverted stream is returned to its natural channel. See also EC-10, Velocity Dissipation Devices.

Temporary Dry Construction Areas

- When dewatering behind temporary structures to create a temporary dry construction area, such as cofferdams, pass pumped water through a sediment-settling device, such as a portable tank or settling basin, before returning water to the water body. See also NS-2, Dewatering Operations.

- Any substance used to assemble or maintain diversion structures, such as form oil, should be non-toxic and non-hazardous.

- Any material used to minimize seepage underneath diversion structures, such as grout, should be non-toxic, non-hazardous, and as close to a neutral pH as possible.

Comparison of Diversion and Isolation Techniques:

- Gravel bags are relatively inexpensive, but installation and removal can be labor intensive. It is also difficult to dewater the isolated area. Sandbags should not be used for this technique in rivers or streams, as sand should never be put into or adjacent to a stream, even if encapsulated in geotextile.

- Gravel Bag Berms (SE-6) used in conjunction with an impermeable membrane are cost effective, and can be dewatered relatively easily. If spawning gravel is used, the impermeable membrane can be removed from the stream, and the gravel can be spread out and left as salmonid spawning habitat if approved in the permit. Only clean, washed gravel should be used for both the gravel bag and gravel berm techniques.

- Cofferdams are relatively expensive, but frequently allow full dewatering. Also, many options now available are relatively easy to install.

- Sheet pile enclosures are a much more expensive solution, but do allow full dewatering. This technique is not well suited to small streams, but can be effective on large rivers or lakes, and where staging and heavy equipment access areas are available.

- K-rails are an isolation method that does not allow full dewatering, but can be used in small to large watercourses, and in fast-water situations.

- A relatively inexpensive isolation method is filter fabric isolation. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place. This method should be used in relatively calm water, and can be used in smaller streams. Note that this is not a dewatering method, but rather a sediment isolation method.

- Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They can also be used for in-stream construction, when dewatering an area is not required.

- When used in watercourses or streams, cofferdams must be used in accordance with permit requirements.

- Manufactured diversion structures should be installed following manufacturer's specifications.

- Filter fabric and turbidity curtain isolation installation methods can be found in the specific technique descriptions that follow.

Filter Fabric Isolation Technique

Definition and Purpose

A filter fabric isolation structure is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. This structure is composed of filter fabric, gravel bags, and steel t-posts.

Appropriate Applications

- Filter fabric may be used for construction activities such as streambank stabilization, or culvert, bridge, pier or abutment installation. It may also be used in combination with other methods, such as clean water bypasses and/or pumps.
- Filter fabric isolation is relatively inexpensive. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place.
- If spawning gravel is used, all other components of the isolation can be removed from the stream, and the gravel may be spread out and left as salmonid spawning habitat if approved in the permit. Whether spawning gravel or other types of gravel are used, only clean washed gravel should be used as infill for the gravel bags or continuous berm.
- This method should be used in relatively calm water, and can be used in smaller streams. This is not a dewatering method, but rather a sediment isolation method.
- Water levels inside and outside the fabric curtain must be about the same, as differential heads will cause the curtain to collapse.

Limitations

- Do not use if the installation, maintenance and removal of the structures will disturb sensitive aquatic species of concern.
- Filter fabrics are not appropriate for projects where dewatering is necessary.
- Filter fabrics are not appropriate to completely dam stream flow.

Design and Installation

- For the filter fabric isolation method, a non-woven or heavy-duty fabric is recommended over standard silt fence. Using rolled geotextiles allows non-standard widths to be used.
- Anchor filter fabric with gravel bags filled with clean, washed gravel. Do not use sand. If a bag should split open, the gravel can be left in the stream, where it can provide aquatic habitat benefits. If a sandbag splits open in a watercourse, the sand could cause a decrease in water quality, and could bury sensitive aquatic habitat.
- Another anchor alternative is a continuous berm, made with the Continuous Berm Machine. This is a gravel-filled bag that can be made in very long segments. The length of the berms is usually limited to 18 ft for ease of handling (otherwise, it gets too heavy to move).

- Place the fabric on the bottom of the stream, and place either a bag of clean, washed gravel or a continuous berm over the bottom of the silt fence fabric, such that a bag-width of fabric lies on the stream bottom. The bag should be placed on what will be the outside of the isolation area.

- Pull the fabric up, and place a metal t-post immediately behind the fabric, on the inside of the isolation area; attach the silt fence to the post with three diagonal nylon ties.

- Continue placing fabric as described above until the entire work area has been isolated, staking the fabric at least every 6 ft.

Inspection and Maintenance

- Immediately repair any gaps, holes or scour.

- Remove and properly dispose of sediment buildup.

- Remove BMP upon completion of construction activity. Recycle or reuse if applicable.

- Revegetate areas disturbed by BMP removal if needed.

Turbidity Curtain Isolation Technique

Definition and Purpose

A turbidity curtain is a fabric barrier used to isolate the near shore work area. The barriers are intended to confine the suspended sediment. The curtain is a floating barrier, and thus does not prevent water from entering the isolated area; rather, it prevents suspended sediment from getting out.

Appropriate Applications

Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They are used when construction activities adjoin quiescent waters, such as lakes, ponds, and slow flowing rivers. The curtains are designed to deflect and contain sediment within a limited area and provide sufficient retention time so that the sediment particles will fall out of suspension.

Limitations

- Turbidity curtains should not be used in flowing water; they are best suited for use in ponds, lakes, and very slow-moving rivers.

- Turbidity curtains should not be placed across the width of a channel.

- Removing sediment that has been deflected and settled out by the curtain may create a discharge problem through the resuspension of particles and by accidental dumping by the removal equipment.

Design and Installation

- Turbidity curtains should be oriented parallel to the direction of flow.

- The curtain should extend the entire depth of the watercourse in calm-water situations.

- In wave conditions, the curtain should extend to within 1 ft of the bottom of the watercourse, such that the curtain does not stir up sediment by hitting the bottom repeatedly. If it is desirable for the curtain to reach the bottom in an active-water situation, a pervious filter fabric may be used for the bottom 1 ft.

- The top of the curtain should consist of flexible flotation buoys, and the bottom should be held down by a load line incorporated into the curtain fabric. The fabric should be a brightly colored impervious mesh.

- The curtain should be held in place by anchors placed at least every 100 ft.

- First, place the anchors, then tow the fabric out in a furled condition, and connect to the anchors. The anchors should be connected to the flotation devices, and not to the bottom of the curtain. Once in place, cut the furling lines, and allow the bottom of the curtain to sink.

- Consideration must be given to the probable outcome of the removal procedure. It must be determined if it will create more of a sediment problem through re-suspension of the particles or by accidental dumping of material during removal. It is recommended that the soil particles trapped by the turbidity curtain only be removed if there has been a significant change in the original contours of the affected area in the watercourse.

- Particles should always be allowed to settle for a minimum of 6 to 12 hours prior to their removal or prior to removal of the turbidity curtain.

Maintenance and Inspection:

- The curtain should be inspected for holes or other problems, and any repairs needed should be made promptly.

- Allow sediment to settle for 6 to 12 hours prior to removal of sediment or curtain. This means that after removing sediment, wait an additional 6 to 12 hours before removing the curtain.

- To remove, install furling lines along the curtain, detach from anchors, and tow out of the water.

K-rail River Isolation

Definition and Purpose

This temporary sediment control or stream isolation method uses K-rails to form the sediment deposition area, or to isolate the in-stream or near-bank construction area.

Barriers are placed end-to-end in a pre-designed configuration and gravel-filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

Appropriate Applications

The K-rail isolation can be used in streams with higher water velocities than many other isolation techniques.

- This technique is also useful at the toe of embankments, and cut or fill slopes.

Limitations

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

Design and Installation

- To create a floor for the K-rail, move large rocks and obstructions. Place washed gravel and gravel-filled bags to create a level surface for K-rails to sit. Washed gravel should always be used.

- Place the bottom two K-rails adjacent to each other, and parallel to the direction of flow; fill the center portion with gravel bags. Then place the third K-rail on top of the bottom two. There should be sufficient gravel bags between the bottom K-rails such that the top rail is supported by the gravel. Place plastic sheeting around the K-rails, and secure at the bottom with gravel bags.

- Further support can be added by pinning and cabling the K-rails together. Also, large riprap and boulders can be used to support either side of the K-rail, especially where there is strong current.

Inspection and Maintenance:

- The barrier should be inspected and any leaks, holes, or other problems should be addressed immediately.

- Sediment should be allowed to settle for at least 6 to 12 hours prior to removal of sediment, and for 6 to 12 hours prior to removal of the barrier.

Stream Diversions

The selection of which stream diversion technique to use will depend upon the type of work involved, physical characteristics of the site, and the volume of water flowing through the project.

Advantages of a Pumped Diversion

- Downstream sediment transport can be nearly eliminated.

- Dewatering of the work area is possible.

- Pipes can be moved around to allow construction operations.

- The dams can serve as temporary access to the site.

- Increased flows can be managed by adding more pumping capacity.

Disadvantages of a Pumped Diversion

- Flow volume is limited by pump capacity.

- A pumped diversion requires 24 hour monitoring of pumps.

- Sudden rain could overtop dams.

- Erosion at the outlet.

- Minor in-stream disturbance is required to install and remove dams.

Advantages of Excavated Channels and Flumes

- Excavated channels isolate work from water flow and allow dewatering.
- Excavated channels can handle larger flows than pumps.

Disadvantages of Excavated Channels and Flumes

- Bypass channel or flume must be sized to handle flows, including possible floods.
- Channels must be protected from erosion.
- Flow diversion and re-direction with small dams involves in-stream disturbance and mobilization of sediment.

Design and Installation

- Installation guidelines will vary based on existing site conditions and type of diversion used.
- Pump capacity must be sufficient for design flow.
- A standby pump is required in case a primary pump fails.
- Dam materials used to create dams upstream and downstream of diversion should be erosion resistant; materials such as steel plate, sheet pile, sandbags, continuous berms, inflatable water bladders, etc., would be acceptable.

When constructing a diversion channel, begin excavation of the channel at the proposed downstream end, and work upstream. Once the watercourse to be diverted is reached and the excavated channel is stable, breach the upstream end and allow water to flow down the new channel. Once flow has been established in the diversion channel, install the diversion weir in the main channel; this will force all water to be diverted from the main channel.

Inspection and Maintenance

- Pumped diversions require 24 hour monitoring of pumps.
- Inspect embankments and diversion channels 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. Remove holes, gaps, or scour.
- Upon completion of work, the diversion or isolation structure should be removed and flow should be redirected through the new culvert or back into the original stream channel. Recycle or reuse if applicable.
- Revegetate areas disturbed by BMP removal if needed.

Costs

Costs of clear water diversion vary considerably and can be very high.

Inspection and Maintenance

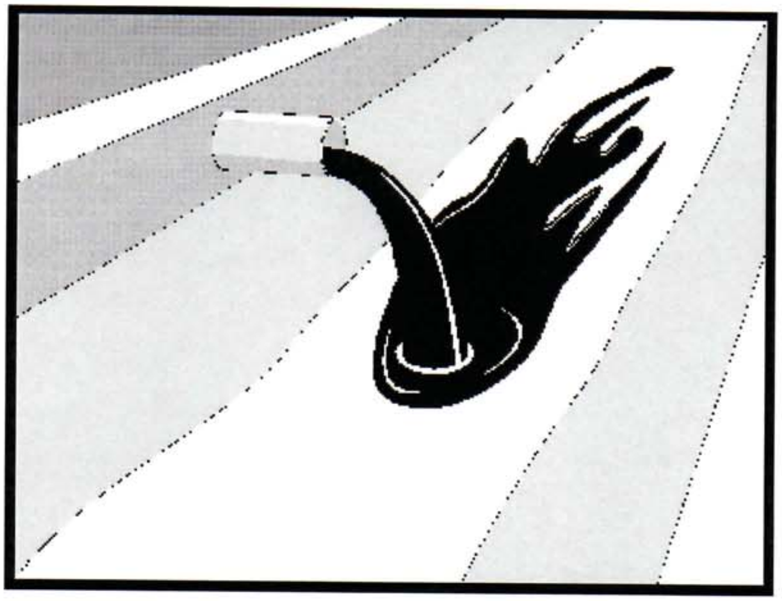
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Refer to BMP-specific inspection and maintenance requirements.

References

California Bank and Shore Rock Slope Protection Design – Practitioners Guide and Field Evaluations of Riprap Methods, Caltrans Study No. F90TL03, October, 2000.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Illicit Connection/Discharge NS-6



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Illicit connection/discharge and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.

Limitations

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor. If pre-existing hazardous materials or wastes are known to exist onsite, they should be identified in the SWPPP and handled as set forth in the SWPPP.

Implementation

Planning

- Review the SWPPP. Pre-existing areas of contamination should be identified and documented in the SWPPP.

- Inspect site before beginning the job for evidence of illicit connections, illegal dumping or discharges. Document any pre-existing conditions and notify the owner.

- Inspect site regularly during project execution for evidence

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of illicit connections, illegal dumping or discharges.

- Observe site perimeter for evidence for potential of illicitly discharged or illegally dumped material, which may enter the job site.

Identification of Illicit Connections and Illegal Dumping or Discharges

- **General** – unlabeled and unidentifiable material should be treated as hazardous.
- **Solids** - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.
- **Liquids** - signs of illegal liquid dumping or discharge can include:
    - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
    - Pungent odors coming from the drainage systems
    - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
    - Abnormal water flow during the dry weather season
- **Urban Areas** - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:
    - Abnormal water flow during the dry weather season
    - Unusual flows in sub drain systems used for dewatering
    - Pungent odors coming from the drainage systems
    - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
    - Excessive sediment deposits, particularly adjacent to or near active offsite construction projects
- **Rural Areas** - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:
    - Abnormal water flow during the non-irrigation season
    - Non-standard junction structures
    - Broken concrete or other disturbances at or near junction structures

Reporting

Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery. For illicit connections or discharges to the storm drain system, notify the local stormwater management agency. For illegal dumping, notify the local law enforcement agency.

Cleanup and Removal

The responsibility for cleanup and removal of illicit or illegal dumping or discharges will vary by location. Contact the local stormwater management agency for further information.

Costs

Costs to look for and report illicit connections and illegal discharges and dumping are low. The best way to avoid costs associated with illicit connections and illegal discharges and dumping is to keep the project perimeters secure to prevent access to the site, to observe the site for vehicles that should not be there, and to document any waste or hazardous materials that exist onsite before taking possession of the site.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect the site regularly to check for any illegal dumping or discharge.

- Prohibit employees and subcontractors from disposing of non-job related debris or materials at the construction site.

- Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

References

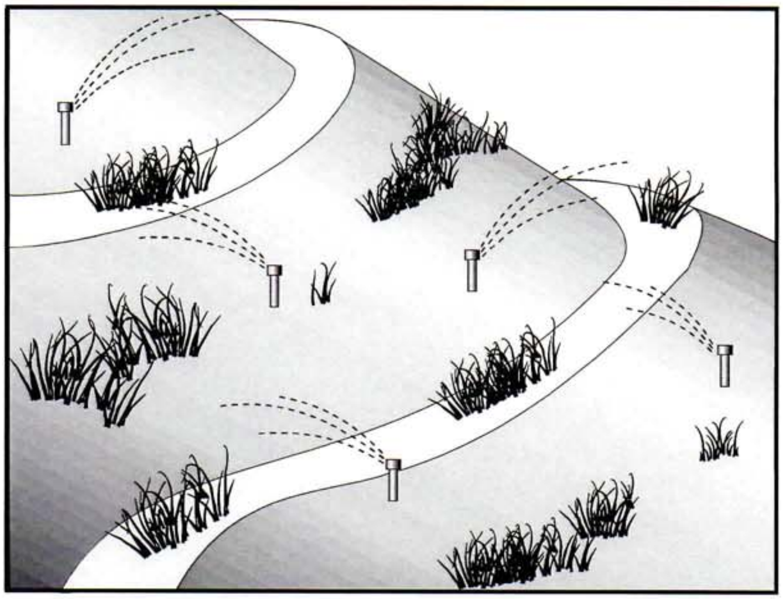
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Potable Water/Irrigation

NS-7



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

Potable Water/Irrigation consists of practices and procedures to manage the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

Suitable Applications

Implement this BMP whenever potable water or irrigation water discharges occur at or enter a construction site.

Limitations

None identified.

Implementation

- Direct water from offsite sources around or through a construction site, where feasible, in a way that minimizes contact with the construction site.
- Discharges from water line flushing should be reused for landscaping purposes where feasible.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream stormwater drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.
- Inspect irrigated areas within the construction limits for

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excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

Costs

Cost to manage potable water and irrigation are low and generally considered to be a normal part of related activities.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Repair broken water lines as soon as possible.
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

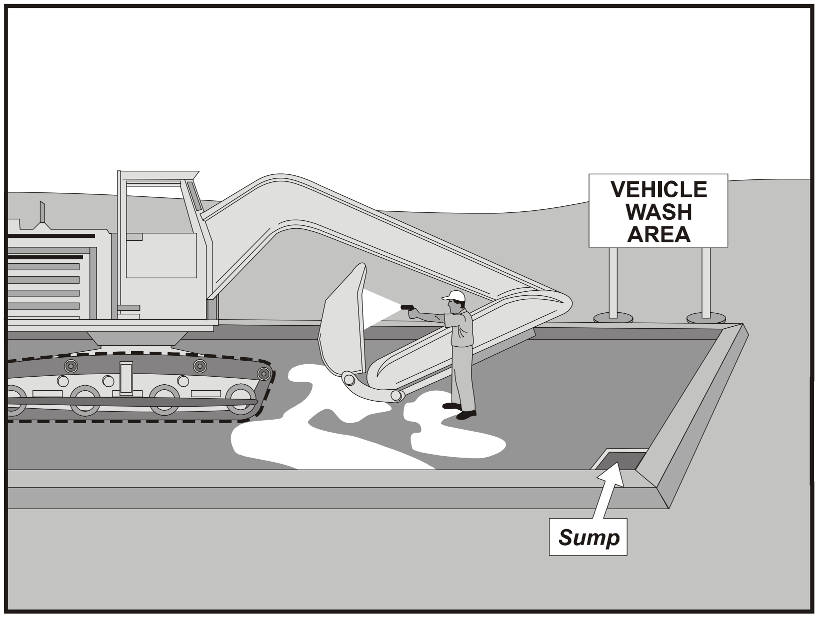
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle and Equipment Cleaning NS-8



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

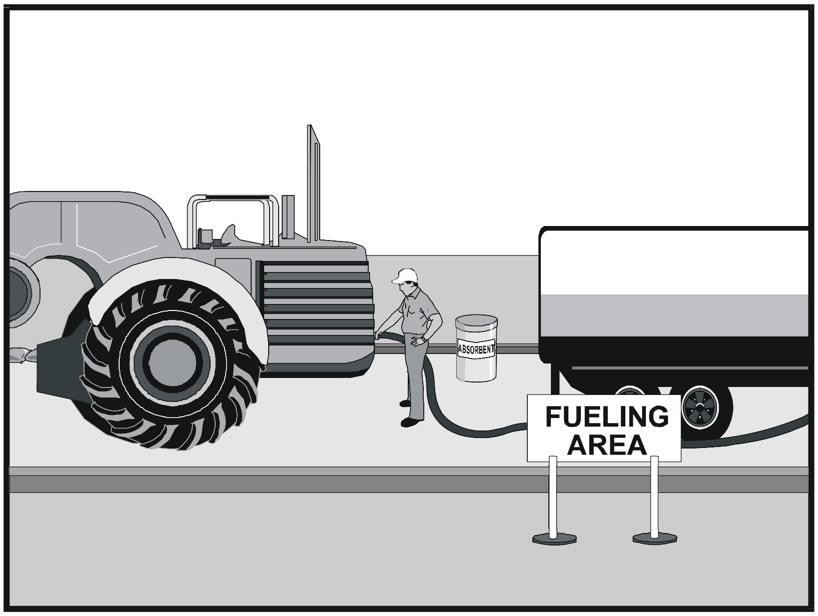
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.

- Discourage “topping-off” of fuel tanks.

- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should

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be disposed of properly after use.

- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.

- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.

- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.

- Train employees and subcontractors in proper fueling and cleanup procedures.

- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.

- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.

- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.

- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.

- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).

- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.

- Keep ample supplies of spill cleanup materials onsite.

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

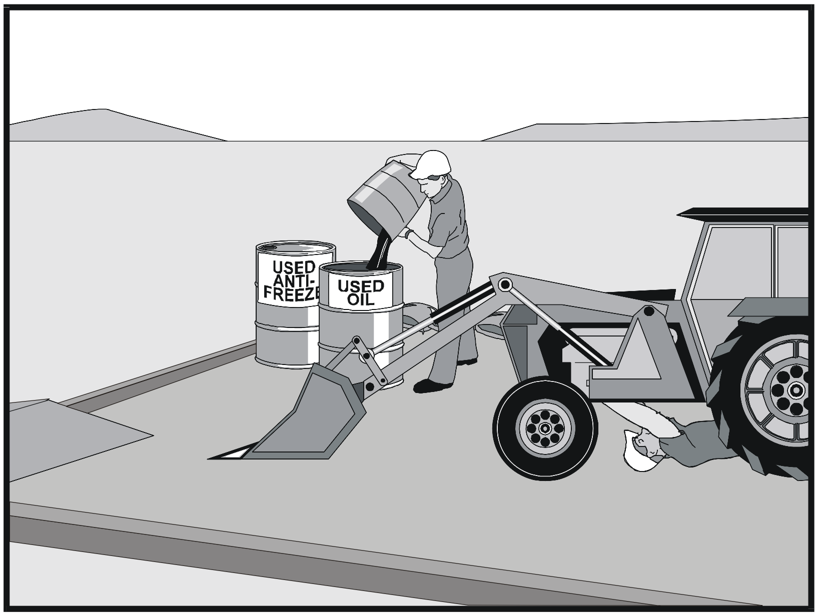
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle & Equipment Maintenance NS-10



Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8, Vehicle and Equipment Cleaning, and NS-9, Vehicle and

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should 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.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should 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 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

- Keep ample supplies of spill cleanup materials onsite.

- Maintain waste fluid containers in leak proof condition.

- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.

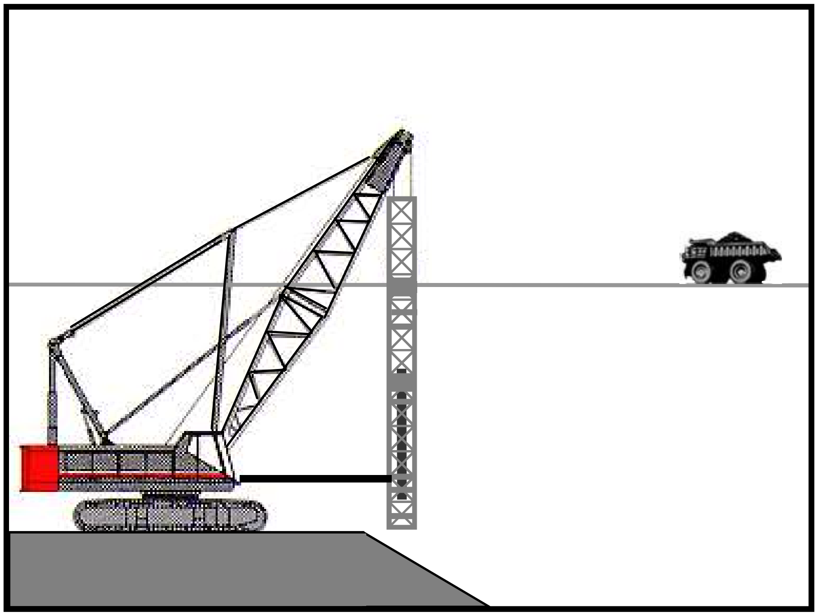
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

The construction and retrofit of bridges and retaining walls often include driving piles for foundation support and shoring operations. Driven piles are typically constructed of precast concrete, steel, or timber. Driven sheet piles are also used for shoring and cofferdam construction. Proper control and use of equipment, materials, and waste products from pile driving operations will reduce or eliminate the discharge of potential pollutants to the storm drain system, watercourses, and waters of the United States.

Suitable Applications

These procedures apply to all construction sites near or adjacent to a watercourse or groundwater where permanent and temporary pile driving (impact and vibratory) takes place, including operations using pile shells as well as construction of cast-in-steel-shell and cast-in-drilled-hole piles.

Limitations

None identified.

Implementation

- Use drip pans or absorbent pads during vehicle and equipment operation, maintenance, cleaning, fueling, and storage. Refer to NS-8, Vehicle and Equipment Cleaning, NS-9, Vehicle and Equipment Fueling, and NS-10, Vehicle and Equipment Maintenance.

- Have spill kits and cleanup materials available at all locations of pile driving. Refer to WM-4, Spill Prevention and Control.

- Equipment that is stored or in use in streambeds, or on docks, barges, or other structures over water bodies should be kept leak free.

- Park equipment over plastic sheeting or equivalent where possible. Plastic is not a substitute for drip pans or absorbent pads. The storage or use of equipment in streambeds or other bodies of water must comply with all applicable permits.

- Implement other BMPs as applicable, such as NS-2, Dewatering Operations, WM-5, Solid Waste Management, WM-6, Hazardous Waste Management, and WM-10, Liquid Waste Management.

- When not in use, store pile-driving equipment away from concentrated flows of stormwater, drainage courses, and inlets. Protect hammers and other hydraulic attachments from runon and runoff by placing them on plywood and covering them with plastic or a comparable material prior to the onset of rain.

- Use less hazardous products, e.g., vegetable oil, when practicable.

Costs
All of the above measures can be low cost.

Inspection and Maintenance
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.

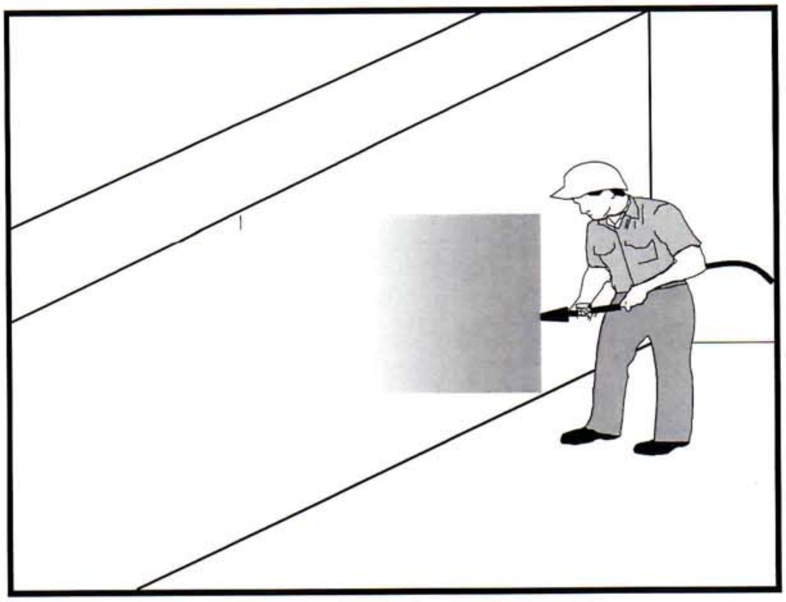
- Inspect equipment every day at startup and repair equipment as needed (i.e., worn or damaged hoses, fittings, and gaskets). Recheck equipment at shift changes or at the end of the day and scheduled repairs as needed.

References
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Concrete Curing

NS-12



Description and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods.

Concrete and its associated curing materials have basic chemical properties that can raise the pH of water to levels outside of the permitted range. Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Proper procedures and care should be taken when managing concrete curing materials to prevent them from coming into contact with stormwater flows, which could result in a high pH discharge.

Suitable Applications

Suitable applications include all projects where Portland Cement Concrete (PCC) and concrete curing chemicals are placed where they can be exposed to rainfall, runoff from other areas, or where runoff from the PCC will leave the site.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

Chemical Curing

- Avoid over spray of curing compounds.
- Minimize the drift by applying the curing compound close to the concrete surface. Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.
- Use proper storage and handling techniques for concrete curing compounds. Refer to WM-1, Material Delivery and Storage.
- Protect drain inlets prior to the application of curing compounds.
- Refer to WM-4, Spill Prevention and Control.

Water Curing for Bridge Decks, Retaining Walls, and other Structures

- Direct cure water away from inlets and watercourses to collection areas for evaporation or other means of removal in accordance with all applicable permits. See WM-8 Concrete Waste Management.
- Collect cure water at the top of slopes and transport to a concrete waste management area in a non-erosive manner. See EC-9 Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

Education

- Educate employees, subcontractors, and suppliers on proper concrete curing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete curing procedures.

Costs

All of the above measures are generally low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts uncured and partially cured concrete as required by the General Permit.
- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.
- Inspect cure containers and spraying equipment for leaks.

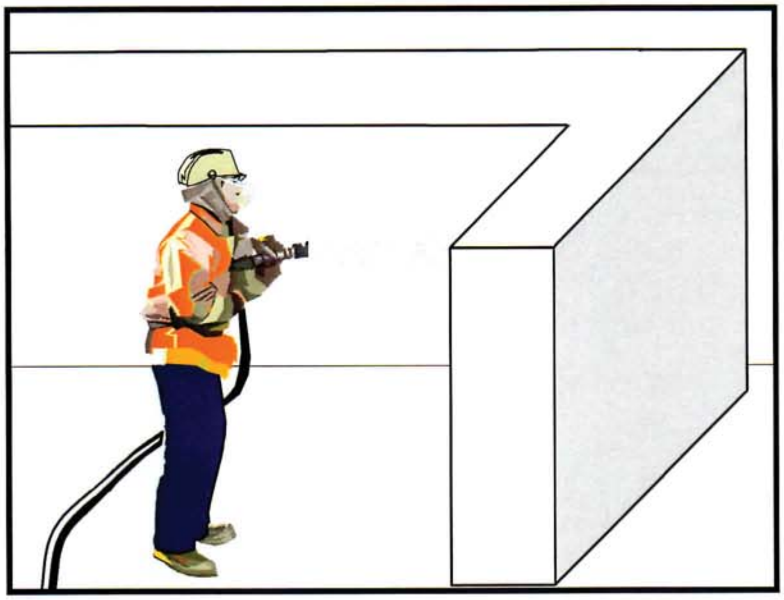
References

Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non Point Source Pollution Control Program, 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



Categories		
EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Category**

☒ **Secondary Category**

Targeted Constituents	
Sediment	☑
Nutrients	
Trash	
Metals	☑
Bacteria	
Oil and Grease	
Organics	☑

Potential Alternatives

None

Description and Purpose

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. Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Concrete and its associated curing materials have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

- Collect and properly dispose of water from high-pressure water blasting operations.
- Collect contaminated water from blasting operations at the top of slopes. Transport or dispose of contaminated water while using BMPs such as those for erosion control. Refer to EC-9, Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Direct water from blasting operations away from inlets and watercourses to collection areas for infiltration or other means of removal (dewatering). Refer to NS-2 Dewatering Operations.
- Protect inlets during sandblasting operations. Refer to SE-10, Storm Drain Inlet Protection.
- Refer to WM-8, Concrete Waste Management for disposal of concrete debris.
- 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 WM-6, Hazardous Waste Management.

Education

- Educate employees, subcontractors, and suppliers on proper concrete finishing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete finishing procedures.

Costs

These measures are generally of low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts concrete dust and debris as required by the General Permit.

- Sweep or vacuum up debris from sandblasting at the end of each shift.
- At the end of each work shift, remove and contain liquid and solid waste from containment structures, if any, and from the general work area.
- Inspect containment structures for damage prior to use and prior to onset of forecasted rain.

References

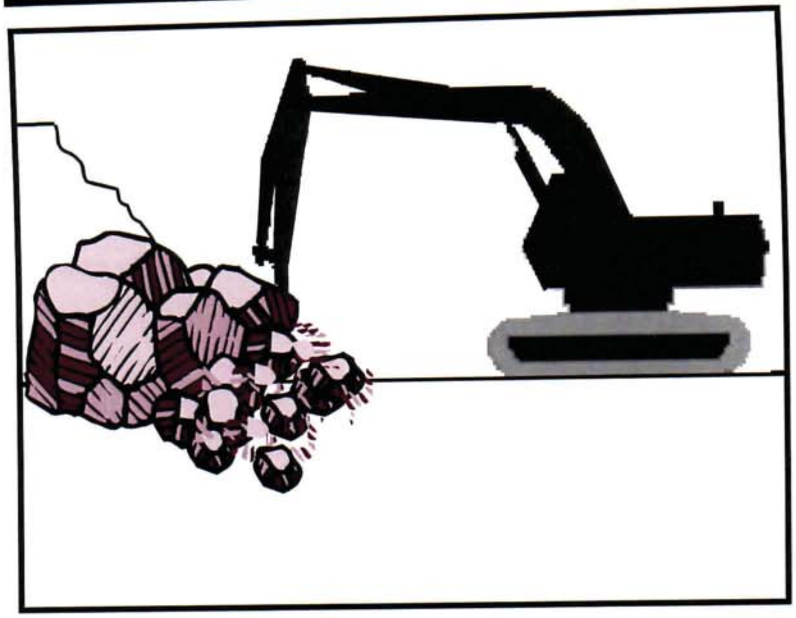
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Demolition Adjacent to Water

NS-15



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Procedures to protect water bodies from debris and wastes associated with structure demolition or removal over or adjacent to watercourses.

Suitable Applications

Full bridge demolition and removal, partial bridge removal (barrier rail, edge of deck) associated with bridge widening projects, concrete channel removal, or any other structure removal that could potentially affect water quality.

Limitations

None identified.

Implementation

- Refer to 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 owner.
- Stockpile accumulated debris and waste generated during demolition away from watercourses and in accordance with WM-3, Stockpile Management.
- Ensure safe passage of wildlife, as necessary.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Discharges to waterways shall be reported to the Regional Water Quality Control Board immediately upon discovery. A written discharge notification must follow within 7 days. Follow the spill reporting procedures in the SWPPP.

- For structures containing hazardous materials, i.e., lead paint or asbestos, refer to BMP WM-6, Hazardous Waste Management. For demolition work involving soil excavation around lead-painted structures, refer to WM-7, Contaminated Soil Management.

Costs

Cost may vary according to the combination of practices implemented.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Any debris-catching devices shall be emptied regularly. Collected debris shall be removed and stored away from the watercourse and protected from runon and runoff.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Attachment P

Sampling Activity Log

MONTGOMERY & ASSOCIATES, INC.

STORMWATER SAMPLING, ANALYSIS & EXCEPTION LOG

0-Jan-00

PROJECT INFORMATION NAME AND ADDRESS	PROJECT SITE RISK LEVEL		
0		CONTRACT NUMBER/CO/RTE/PM	
0	☐ Risk Level 3	PROJECT IDENTIFIER NUMBER	
0	☐ Risk Level 2	WDID NUMBER	
0	☐		

SAMPLERS NAME, TITLE, and SIGNATURE	DATE	Samplers Phone Number
xxx	0-Jan-00	

CALIBRATION					
	Turbidity Meter Manufacturer	Model Number	Serial Number	Calibration Date	Time Rain Event Started
	pH Meter Manufacturer	Model Number	Serial Number	Calibration Date	Time Rain Event Ended

Are Laboratory test results attached to this report?	☐ Yes ☐ No
Numeric Action Level Exceedance? (Risk Level 2 Only)	☐ Yes ☐ No ☐ N/A
Numeric Effluent Limitation Exceedance? (Risk Level 3 Only)	☐ Yes ☐ No ☐ N/A

DAILY AVERAGE of Samples taken for this Inspection

Total Daily average of NTUs	Total Daily average of pH samples		

STORMWATER SAMPLING AND ANALYSIS LOG

Sampling Point	Sampling Date	Sampling Location (Description)	Time Sample Taken	% of the total run-off at this sample point	Turbidity (NTU)	Ph	Average Ntu's *	Average pH *	Comments / Exceptions

Total Daily average of NTUs			Total Daily average of pH samples						

Total Daily average of NTUs			Total Daily average of pH samples						

* = Use averages when there are less than three sample points, write in all three samples in the "Comments" area for SMARTS purposes

COMMENTS / AMENDMENTS NEEDED:

I certify under penalty of law that this Stormwater Inspection Report was performed in accordance with the General Permit. The information contained in this inspection report was gathered from a field site inspection. I am aware that section 309 (c)(4) of the Clean Water Act provides for significant penalties, including fines and imprisonment for knowingly submitting false material statement, representation or certification.

Stormwater Inspector Name	Date Report Completed
0	0-Jan-00

Stormwater Inspector Signature

I certify under penalty of law that this Stormwater Inspection Report was performed in accordance with the General Permit by me or under my direction or supervision. The information contained in this inspection report was gathered and evaluated by qualified personnel prior to submittal. Based on my review of the information and inquiry of those who gathered and evaluated the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

QSD Name	Date
0	0-Jan-00

QSD Signature

Stormwater Inspection Report Acceptance

Accepted by Resident Engineer (Name)	Date

Resident Engineer Signature

Attachment Q

Pollutant Testing Guidance Table

POLLUTANT TESTING GUIDANCE TABLE [1]					
Category	**Construction Site Material**	**Visually Observable?**	**Pollutant Indicators [2]**	**Suggested Analyses Field [3]**	**Laboratory**
Asphalt Products	Hot Asphalt	Yes - Rainbow Surface or Brown Suspension	Visually Observable - No Testing Required		
	Asphalt Emulsion				
	Liquid Asphalt (tack coat)				
	Cold Mix				
	Crumb Rubber	Yes – Black, solid material	Visually Observable - No Testing Required		
	Asphalt Concrete (Any Type)	Yes - Rainbow Surface or Brown Suspension	Visually Observable - No Testing Required		
Cleaning Products	Acids	No	pH Acidity Anions (acetic acid, phosphoric acid, sulfuric acid, nitric acid, hydrogen chloride)	pH Meter Acidity Test Kit	EPA 150.1 (pH)
					SM 2310B (Acidity)
					EPA 300.0 (Anion)
	Detergents	Yes - Foam	Visually Observable - No Testing Required		
	TSP	No	Phosphate	Phosphate	EPA 365.3 (Phosphate)
	Solvents	No	**VOC**	None	EPA 601/602 or EPA 624 (VOC)
			SVOC	None	EPA 625 (SVOC)

POLLUTANT TESTING GUIDANCE TABLE [1]					
Category	**Construction Site Material**	**Visually Observable?**	**Pollutant Indicators [2]**	**Suggested Analyses Field [3]**	**Laboratory**
Portland Concrete Cement & Masonry Products	Portland Cement (PCC)	Yes - Milky Liquid	Visually Observable - No Testing Required		
	Masonry products	No	pH	pH Meter Alkalinity or Acidity Test Kit	EPA 150.1 (pH)
			Alkalinity		SM 2320 (Alkalinity)
	Sealant (Methyl Methacrylate - MMA)	No	Methyl Methacrylate	None	EPA 625 (SVOC)
			Cobalt		EPA 200.8 (Metal)
			Zinc		
	Incinerator Bottom Ash Bottom Ash Steel Slag Foundry Sand Fly Ash Municipal Solid Waste	No	Aluminum Calcium Vanadium Zinc	Calcium Test	EPA 200.8 (Metal) EPA 200.7 (Calcium)
	Mortar	Yes - Milky Liquid	Visually Observable - No Testing Required		
	Concrete Rinse Water	Yes - Milky Liquid	Visually Observable - No Testing Required		
	Non-Pigmented Curing Compounds	No	Acidity	pH Meter Alkalinity or Acidity Test Kit	SM 2310B (Acidity)
			Alkalinity		SM 2320 (Alkalinity)
			pH		EPA 150.1 (pH)
			VOC		EPA 601/602 or EPA 624 (VOC)
			SVOC		EPA 625 (SVOC)

POLLUTANT TESTING GUIDANCE TABLE [1]

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
Landscaping and Other Products	Aluminum Sulfate	No	Aluminum	TDS Meter Sulfate	EPA 200.8 (Metal)
			TDS		EPA 160.1 (TDS)
			Sulfate		EPA 300.0 (Sulfate)
	Sulfur-Elemental	No	Sulfate	Sulfate	EPA 300.0 (Sulfate)
	Fertilizers-Inorganic [4]	No	Nitrate	Nitrate	EPA 300.0 (Nitrate)
			Phosphate	Phosphate	EPA 365.3 (Phosphate)
			Organic Nitrogen	None	EPA 351.3 (TKN)
			Potassium	None	EPA 200.8 (Metal)
	Fertilizers-Organic	No	TOC	Nitrate	EPA 415.1 (TOC)
			Nitrate		EPA 300.0 (Nitrate)
			Organic Nitrogen		EPA 351.3 (TKN)
			COD		EPA 410.4 (COD)
	Natural Earth (Sand, Gravel, and Topsoil)	Yes - Cloudiness and turbidity	Visually Observable - No Testing Required		
	Herbicide	No	Herbicide	None	Check lab for specific herbicide or pesticide
	Pesticide		**Pesticide**		
	Lime		Alkalinity	pH Meter Alkalinity or Acidity Test Kit	SM 2320 (Alkalinity)
			pH		EPA 150.1 (pH)

POLLUTANT TESTING GUIDANCE TABLE [1]					
Category	**Construction Site Material**	**Visually Observable?**	**Pollutant Indicators [2]**	**Suggested Analyses Field [3]**	**Laboratory**
Painting Products	Paint	Yes	Visually Observable - No Testing Required		
	Paint Strippers	No	VOC	None	EPA 601/602 or EPA 624 (VOC)
			SVOC	None	EPA 625 (SVOC)
	Resins	No	COD	None	EPA 410.4 (COD)
			SVOC		EPA 625 (SVOC)
	Sealants	No	COD	None	EPA 410.4 (COD)
	Lacquers, Varnish, Enamels, and Turpentine	No	COD	None	EPA 410.4 (COD)
			VOC		EPA 601/602 or EPA 624 (VOC)
			SVOC		EPA 625 (SVOC)
	Thinners	No	VOC	None	EPA 601/602 or EPA 624 (VOC)
			COD		EPA 410.4 (COD)
Portable Toilet Waste Products	Portable Toilet Waste	Yes	Visually Observable - No Testing Required		

POLLUTANT TESTING GUIDANCE TABLE [1]

Category	Construction Site Material	Visually Observable?	Pollutant Indicators [2]	Suggested Analyses Field [3]	Laboratory
Contaminated Soil [5]	Aerially Deposited Lead[3]	No	Lead	None	EPA 200.8 (Metal)
	Petroleum	Yes – Rainbow Surface Sheen and Odor	Visually Observable - No Testing Required		
	Other	No	Contaminant Specific	Contaminant Specific	Contaminant Specific
Line Flushing Products	Chlorinated Water	No	Total chlorine	Chlorine	SM 4500-CL G (Res. Chlorine)
Adhesives	Adhesives	No	COD	None	EPA 410.4 (COD)
			Phenols	Phenol	EPA 420.1 (Phenol)
			SVOC	None	EPA 625 (SVOC)
Dust Palliative Products	Salts (Magnesium Chloride, Calcium Chloride, and Natural Brines)	No	Chloride	Chloride	EPA 300.0 (Chloride)
			TDS	TDS Meter	EPA 160.1 (TDS)
			Cations (Sodium, Magnesium, Calcium)	None	EPA 200.7 (Cations)
Vehicle	Antifreeze and Other Vehicle Fluids	Yes - Colored Liquid	Visually Observable - No Testing Required		
	Batteries	No	Sulfuric Acid	None	EPA 300.0 (Sulfate)
			Lead	None	EPA 200.8 (Metal)
			pH	pH Meter Alkalinity or Acidity Test Kit	EPA 150.1 (pH)
	Fuels, Oils, Lubricants	Yes - Rainbow Surface Sheen and Odor	Visually Observable - No Testing Required		

POLLUTANT TESTING GUIDANCE TABLE [1]					
Category	**Construction Site Material**	**Visually Observable?**	**Pollutant Indicators [2]**	**Suggested Analyses Field [3]**	**Laboratory**
Soil Amendment/Stabilization Products	Polymer/Copolymer [6, 7]	No	Organic Nitrogen	None	EPA 351.3 (TKN)
			BOD	None	EPA 405.1 (BOD)
			COD	None	EPA 410.4 (COD)
			DOC	None	EPA 415.1 (DOC)
			Nitrate	Nitrate	EPA 300.0 (Nitrate)
			Sulfate	Sulfate	EPA 300.0 (Sulfate)
			Nickel	None	EPA 200.8 (Metal)
	Straw/Mulch	Yes - Solids	Visually Observable - No Testing Required		
	Lignin Sulfonate	No	Alkalinity	Alkalinity	SM 2320 (Alkalinity)
			TDS	TDS Meter	EPA 160.1 (TDS)
	Psyllium	No	COD	None	EPA 410.4 (COD)
			TOC		EPA 415.1 (TOC)
	Guar/Plant Gums	No	COD	None	EPA 410.4 (COD)
			TOC		EPA 415.1 (TOC)
			Nickel		EPA 200.8 (Metal)
	Gypsum	No	pH	pH Meter Alkalinity or Acidity Test Kit	EPA 150.1 (pH)
			Calcium	Calcium	EPA 200.7 (Calcium)
			Sulfate	Sulfate	EPA 300.0 (Sulfate)
			Aluminum	None	EPA 200.8 (Metal)
			Barium		
			Manganese		
			Vanadium		

Notes:

1. 1 If specific pollutant is known, analyze only for that specific pollutant. See MSDS to verify.
2. For each construction material, test for one of the pollutant indicators. Bolded pollutant indicates lowest analysis cost or best indicator. However, the composition of the specific construction material, if known, is the first criterion for selecting which analysis to use.
3. See www.hach.com, www.lamotte.com, www.ysi.com and www.chemetrics.com for some of the test kits
4. If the type of inorganic fertilizer is unknown, analyze for all pollutant indicators listed.
5. Only if special handling requirements are required in the contract documents for aerially deposited lead (ADL)
6. If used with a dye or fiber matrix, it is considered visually observable and no testing is required.
7. Based upon research conducted by the State of California Department of Transportation (Caltrans), the following copolymers/polymers do not discharge pollutants and water quality sampling and analysis is **not** required: Super Tak™, M-Binder™, Fish Stik™, Pro40dc™, Fisch-Bond™, and Soil Master WR™.
8. The 401 Certification, Condition 15-e, states the following requirement for nutrients: Nutrients - the receiving waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses. Monitoring for this objective should involve visual observations for signs of rapid or excessive aquatic growth within or downgradient of the Project area. If observed, (a) report to Regional Water Quality Control Board, and (b) determine source(s) and (c) remediate if determined to be result of Project activities

Attachment R

Non Stormwater Discharge Reporting Log

NON STORMWATER DISCHARGE REPORTING LOG			
DATE	**MATERIAL(S) DISCHARGED**	**ESTIMATED QUANTITY**	**OBSERVED BY**

Attachment S

Rain Event Action Plan (REAP)

MONTGOMERY & ASSOCIATES, INC.

RAIN EVENT ACTION PLAN

PROJECT INFORMATION NAME AND SITE ADDRESS	CONTRACT NUMBER/CO/RTE/PM
0 0 0 0	0 PROJECT IDENTIFIER NUMBER 0 WDID NUMBER 0
CONTRACTOR NAME AND ADDRESS	PROJECT RISK LEVEL
0 0 0	☐ Risk Level 1 ☐ Risk Level 2 ☐ Risk Level 3

QSD NAME, COMPANY NAME	DATE
0	0-Jan-00

QSD PHONE NUMBER	QSD EMERGENCY (24/7) PHONE NUMBER
EROSION AND SEDIMENT CONTROL PROVIDER NAME AND COMPANY	PHONE NUMBER AND EMERGENCY (24/7) PHONE NUMBER
STORMWATER SAMPLING AND TESTING AGENT NAME AND COMPANY	PHONE NUMBER AND EMERGENCY (24/7) PHONE NUMBER

Storm Information

Attach forecasted precipitation information from the National Weather Services Forecast Office website, http://www.srh.noaa.gov/forecast

Project site location	Date forecast checked	Time forecast checked
Forecast % probability of precipitation in next 24 hours	Expected precipitation amount	Date
Forecast % probability of precipitation in 24 to 48 hours	Expected precipitation amount	Date
Forecast % probability of precipitation in 48 to 72 hours	Expected precipitation amount	Date

Is storm predicted to produce 1/2-inch or more of rain?

☐ Yes ☐ No

Note: A qualifying rain event happens when a predicted weater patterrn will produce 1/2-inch or more of precipitation. A qualifying rain event will require stormwater visual monitoring site inspections and sampling and analysis of stormwater discharges.

Activities Associated with Highway Construction Projects or General Construction Projects

☐ Clearing and Grubbing	☐ Finish Grading	☐ Traffic Striping and Pavement Markings
☐ Earthwork	☐ Structure Construction	☐ Highway Planting / Landscape Planting
☑ Culvert Construction	☐ Soundwall Construction	☐ Soil Amendments
☐ Rough Grading	☐ Curbs, Gutters, and Sidewalks	☐ Plant Establishment
☐ Storm Drain Installation	☐ Paving Operations	☐ Material Delivery and Storage
☐ Utility Installation (water, gas, sewer)	☐ Finishing Roadway	☐ Equipment Maintenance and Fueling
☐ Structure Foundations (including piles)	☐ Metal Beam Guard Rail Installation	☐ Erosion and Sediment Control
☐ Subgrade Grading	☐ Sign Installation	☐ Other ____________
☐ Subbase and Base Placement	☐ Highway Electrical Work	☐ Other

Subcontractors or Trades Active on Site

Check all boxes that apply to current project site.

☐ Grading (Operating Engineers)	☐ Curb, Gutter , Sidewalks (carpenters, laborers, concrete finishers)
☐ Underground Storm Drain (operating engineers and laborers)	☐ Lighting and Signals (operating engineers and electricians)
☐ Underground Utilities (operating engineers and laborers)	☐ Metal Beam Guard Rail (operating engineers and laborers)
☐ Underground Utilities (public or private utility company)	☐ Signs (operating engineers)
☐ Pile Installation (pile butts)	☐ Traffic Striping and pavement markings
☐ Concrete Foundations (carpenters, laborers, and concrete finishers)	☐ Masonry soundwalls (masons and laborers)
☐ Bar Reinforcement Placement	☐ Erosion and Sediment Control
☐ Structure Construction (carpenters and laborers)	☐ Highway and Landscape Planting (laborers)
☐ Concrete Placement (operating engineer, laborers, concrete finishers)	☐ Other ____________
☐ Hot Mix Asphalt Placement (operating engineers and laborers)	☐ Other

Trade (Subcontractor) information Provided

☐ Project SWPPP Handout	☐ Tailgate Meetings
☐ Contract Specifications	☐ Poster and Signage
☐ Educational Material Handout	☐ SWPPP Training Workshop

DATE 0-Jan-00

PROJECT INFORMATION NAME AND SITE ADDRESS	CONTRACT NUMBER/CO/RTE/PM
0 0 0 0 0	0 PROJECT IDENTIFIER NUMBER 0 WDID NUMBER 0

Activity	Actions Required Before Predicted Rain Event
	☐ Project superintendent informed of predicted rain at (time) on (date). ☐ Foreman and subcontractors informed of predicted rain. ☐ Erosion Control or sediment control provider notified to provide: ☐ Pre-storm crew with at least _______ people ☐ Crew to start implementing storm event actions by ________ (time) & ______ (date)
Sampling	☐ Sample collection and testing provider alerted if non-visible pollutant sampling and testing required. If M& A, then list of non-visible pollutant sampling locations: ______ ______ ______ ______ ______
Information and Scheduling	☐ Check that adequate erosion and sediment control materials are on hand for: ☐ Pre-Storm required actions ☐ Extended storm event maintenance and repair ☐ BMP site map is up to date ☐ The During Storm inspection has been scheduled ☐ The erosion / sediment control provider has been notified of the event
Material Storage Areas	☐ Materials Covered or in sheds ☐ Stockpiles covered ☐ Perimeter Controls installed
Waste Management Areas	☐ Waste containers covered or lids closed ☐ Drain holes plugged. No apparent holes or tears in containers ☐ Sanitary Stations bermed, or contain secondary containment device, braced.
Concrete Waste Mgmt	☐ Washout bins covered ☐ Adequate capacity for rain ☐ All spills are cleaned from ground and surrounding areas
Operations	☐ Operations to be shut down during rain event: ☐ Grading ☐ Concrete Pours ☐ Hot Mix Asphalt Paving ☐ Soil Amendments not to be applied within 24 hours of the start of the rain event.
Secure Site	☐ Materials and Equipment properly stored and covered ☐ All Waste and Debris properly contained in covered waste containers ☐ Perimeter controls around all disturbed soil areas
Erosion and Sediment Controls	☐ Site perimeter controls are in place ☐ Catch Basin and Drain Inlet protection is in place, properly installed and clear of debris ☐ Sediment Basin and Traps have adequate capacity ☐ Access Roads are swept and free of debris
Spills and Drips	☐ Clean up all spills and drips, including paint, fuel, and oils ☐ Empty drip pans under equipment

DATE 0-Jan-00

PROJECT INFORMATION NAME AND SITE ADDRESS	CONTRACT NUMBER/CO/RTE/PM
0 0 0 0 0	0 PROJECT IDENTIFIER NUMBER 0 WDID NUMBER 0

IDENTIFIED CORRECTIVE ACTIONS

- ☐ ____________________
- ☐ ____________________
- ☐ ____________________
- ☐ ____________________
- ☐ ____________________
- ☐ ____________________
- ☐ ____________________

COMMENTS / AMENDMENT NEEDED:

Stormwater Inspection Report Certification

I certify under penalty of law that this Stormwater Inspection Report was performed in accordance with the General Permit. The information contained in this inspection report was gathered from a field site inspection. I am aware that section 309 (c)(4) of the Clean Water Act provides for significant penalties, including fines and imprisonment for knowingly submitting false material statement, representation or certification.

Stormwater Inspector Name	Date Report Completed
0	

Stormwater Inspector Signature

I certify under penalty of law that this Stormwater Inspection Report was performed in accordance with the General Permit by me or under my direction or supervision. The information contained in this inspection report was gathered and evaluated by qualified personnel prior to submittal. Based on my review of the information and inquiry of those who gathered and evaluated the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

I am aware that Section 309 (c)(4) of the Clean Water Act provides for significant penalties, including fines and imprisonment for knowingly submitting false material statement, representation, or certification.

QSD Name	Date
0	

QSD Signature

Stormwater Inspection Report Acceptance

Accepted by Resident Engineer (Name)	Date

Resident Engineer Signature

Attachment T

Numeric Action Level (NAL)
Exceedance Reports

MONTGOMERY & ASSOCIATES, INC.

NAL EXCEEDANCE REPORT

PROJECT INFORMATION NAME AND SITE ADDRESS	CONTRACT NUMBER/CO/RTE/PM
0 0 0 0	0 PROJECT IDENTIFIER NUMBER 0 WDID NUMBER 0
CONTRACTOR NAME AND ADDRESS	PROJECT RISK LEVEL
0 0 0	☐ Risk Level 2 ☐ Risk Level 3

INSPECTORS NAME, TITLE, AND SIGNATURE	DATE
0	0-Jan-00
SUBMITTED BY CONTRACTOR (print and sign name)	DATE

Numeric Action Level Exceedance Information

DATE SAMPLES TAKEN	DATE and TIME QSD NOTIFIED	DATE and TIME RESIDENT ENGINEER NOTIFIED

EXCEEDANCE IDENTIFIED BY STORM WATER VISUAL SITE INSPECTION?	☐ YES	☐ NO
EXCEEDANCE DISCOVERED BY CONTRACTOR DURING DAILY WORK?	☐ YES	☐ NO
EXCEEDANCE IDENTIFIED BY REGIONAL WQCB?	☐ YES	☐ NO
EXCEEDANCE IDENTIFIED BY STATE WQCB?	☐ YES	☐ NO
WERE SAMPLES TAKEN?	☐ YES	☐ NO

SAMPLES TYPE: ☐ Stormwater ☐ Authorized Non-Stormwater ☐ Non-Authorized Non-Stormwater

EXCEEDANCE TYPE: ☐ Turbidity ☐ pH ☐ Other:

Storm Event Information

DATE AND TIME START OF RAIN EVENT	DATE AND TIME END OF RAIN EVENT	DURATION OF RAIN EVENT (HOURS)	PRECIPITATION AMOUNT (RAIN GUAGE)

Numeric Action Level Exceedance Information	Photographs?
What was the possible nature and cause of the water quality standard exceedance based on a visual observation?	☐ YES ☐ NO
BMP's currently installed at the location of the exceedance	☐ YES ☐ NO
Implementation Schedule for addional BMP's	☐ YES ☐ NO
Summary of actions taken to reduce the pollutants causing or contributing to the water quality standard exceedance	☐ YES ☐ NO

DATE OF SAMPLING	NAME OF SAMPLE COLLECTOR	NAME OF SAMPLE ANALYZER	ANALYZER PHONE NUMBER
TURBIDITY METER MANUFACTURER	TURBIDITY METER MODEL NUMBER	TURBIDITY METER SERIAL NUMBER	CALIBRATION DATE
PH METER MANUFACTURER	PH METER MODEL NUMBER	PH METER SERIAL NUMBER	CALIBRATION DATE

DATE 0-Jan-00

PROJECT INFORMATION NAME AND SITE ADDRESS	CONTRACT NUMBER/CO/RTE/PM
0	0
0	PROJECT IDENTIFIER NUMBER
0	0
0	WDID NUMBER
0	0

Sampling and Analysis Results

Required when exceedance samples are taken

SAMPLE LOCATION	SAMPLE COLLECTION DATE / TIME	Est PRECIPITATION at time of SAMPLE	EXCEEDANCE MEASUREMENT
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

Sampling and Analysis Results

Required when run-on or upgrade samples are taken

SAMPLE LOCATION	SAMPLE COLLECTION DATE / TIME	Est PRECIPITATION at time of SAMPLE	EXCEEDANCE MEASUREMENT
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

QSD (NAME)	DATE
0	0-Jan-00
QSD (SIGNATURE)	DATE
	0-Jan-00

ACCEPTED BY RESIDNET ENGINEER (NAME)	DATE
ACCEPTED BY RESIDNET ENGINEER (SIGNATURE)	DATE

Exceedance reported to the Regional Water Quality Control Board (RWQCB) via e-mail or telephone within 48hours?	☐ YES	☐ NO
NAL Exceedance Report submitted to RWQCB within 14 days?	☐ YES	☐ NO

Attachment U

Approved SWPPP Amendments

Remaining Comments SWPPP July 6 2016

1. There are still a few sample points that look to be on the golf course; those can be field adjusted with an Amendment as construction progresses and the discharge points are more clearly observed in the field.

Agree

2. They did not include the visual monitoring for nutrients (algae blooms that we discussed). Suggest to hand note on inspections forms or add to subsequent amendment.

Text added to second paragraph of Section 600.2 and third paragraph of Section 600.4 and in Comments Section of Weekly Inspection Report Form.

3. Page 10. 300.1 Project Description: Please revise the second paragraph as shown below:

. San Francisquito Creek is a tidal channel bordered by levees on both sides that have overtopped resulting in flooding to adjacent properties, most recently in 2012. One of the fundamental purposes of the project is to keep stormwater from flowing over streets and through homes before it enters the Bay, and instead to transmit stormwater within a marshplain channel. The current channel capacity is 5,300 cubic feet per second (cfs). A Caltrans Highway 101 project scheduled to be completed in 2017, and a future project planned by the San Francisquito Creek Joint Powers Authority (SFCJPA), will increase downstream flows to 7,400 cfs. This Project is designed to convey 9,400 cfs during extreme tides with allowance for 26 inches (approximately 50 years) of anticipated sea level rise. This will be accomplished by widening the creek channel to create a new marsh floodplain, construct floodwalls in areas constrained by existing adjacent infrastructure, and remove and rebuild levees to current engineering standards. The project will create 15.14 acres of new and restored marsh.

Project components consist of: removing approximately 5,300 feet of existing levees, constructing 5,689 feet of new levees, replacing and constructing bike and pedestrian paths, including a 16- foot wide by 2,650-foot long paved Bay Trail portion that can also be used for levee maintenance, ramps to access the new trails, including pedestrian ramps and boardwalk, reconstructed concrete pipe stormwater outfalls, new rock slope protection and restored native vegetation.

The project will require utility line realignment, vegetation removal as well as sheet pile installation for the new floodwalls. The realignment of the gas transmission pipeline by Pacific Gas and Electric (PG&E) will be covered by PG&E's LUP type SWPPP Segment Amendment under their 2016 Gas Transmission Programmatic –Region 2 SWPPP, WDID No. 2 41C375808. Utility replacement by

East Palo Alto Sanitary District, new vegetation plantings within the Faber Marsh Tract levee adjacent to the Project, construction of in-channel root wad structures to reduce flow velocity for endangered steelhead, and construction of five new island refugia in Faber Marsh for endangered marsh species are planned to be added to this project as additional construction activities. Once more information is known about locations and durations, the SWPPP will be amended with new locations and BMPs.

The SFCJPA and SCVWD (or designee) will coordinate and oversee construction activities so that each project element achieves the same outcome of protecting water quality during construction. For this project, oversight will be supplied by Rachael Keish, PE, QSD/P, and other staff of Keish Environmental, San Jose, CA

Added to Section 300.1

3. Page 12, Items 1-3, and 5: WPC not defined, remnant of CalTrans verbiage? This is also in inspection forms.

WPC = Water Pollution Control. This describes the type of construction activities that the QSP oversees.

4. Page 26 Section 500.1 WPC Manager wording- please remove/revise. See above. Either define or remove for clarity.

WPC Manager text changed to "QSD" in Section 500.9 REAPs.

5. Page 72. Sampling locations for run on do not show Cal Trans San Francisquito Creek dewatering operations on east side of Highway 101. Please note this on Figure. Sample designation is different than listed on Table on Page 31.

Adjacent Areas Run-on Exhibit has been revised to add this note and rename the sampling designations.

6. Permits are missing May 25, 2016 Army Corps Engineers Permit Modification. Please add.

Added after original USACE permit docs.

7. GIS determination of total project acreage, is 58 acres. This includes 5.7 acres in Faber Marsh. We will use the 35 acres for immediate construction project as determined by Montgomery, and add additional acres in SWPPP amendment for that work. Suggest definitive acreage evaluation using construction CADD drawings.

No changes made at this time. M&A agrees that the amendment process can capture additional acreage added to Teichert's portion of the project. CADD drawings were not available to M&A. Teichert's understanding is that 35 acres is the total disturbance. The additional acreage appears to part of the nearby project being performed by a separate contractor.