

PUBLIC REVIEW DRAFT
DRAFT ENVIRONMENTAL IMPACT REPORT

**Santa Clara Valley Water District
Sunnyvale East and West Channels
Flood Protection Project**

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Acronyms and Abbreviations

§	section
2010 Thresholds	Bay Area Air Quality Management District's 2010 CEQA Guidelines
AB	Assembly Bill
ACHP	Advisory Council on Historic Preservation
ADT	average daily traffic
Alquist-Priolo Act	Alquist-Priolo Earthquake Fault Zoning Act
APE	Area of Potential Effects
BAAQMD	Bay Area Air Quality Management District
Bay Area CAP	Bay Area Clean Air Plan
Bay Area	San Francisco Bay Area
Bay Plan	<i>San Francisco Bay Plan</i>
Bay Trail	San Francisco Bay Trail
Bay	San Francisco Bay
BCDC	San Francisco Bay Conservation and Development Commission
Bicycle Plan	<i>City of Sunnyvale 2006 Bicycle Plan</i>
BLM	Bureau of Land Management
BMPs	best management practices
Board	Board of Directors
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Cal. Code Regs.	California Code of Regulations
Cal/OSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation
CAP	Climate Action Plan
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act; or the Superfund Act
cfs	cubic feet per second
CH ₄	methane
CHRIS	California Historical Resources Information System
City	City of Sunnyvale (government entity)
cKOP	candidate key observation point
CMP	Congestion Management Plan
CNEL	community noise equivalent level

CO	carbon monoxide
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
County	Santa Clara County (government entity)
CRHR	California Register of Historical Resources
CSC	Clean, Safe Creeks and Natural Flood Protection
CSC Program	Clean, Safe Creeks Program
CSGMP	Contaminated Soil and Groundwater Management Plan
CUPA	Certified Unified Program Agency
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
DDT	dichlorodiphenyltrichloroethane
District	Santa Clara Valley Water District
DPR	California Department of Parks and Recreation
DTSC	California Department of Toxic Substances Control
EA	environmental assessment
East Channel	Sunnyvale East Channel
EIR	Environmental Impact Report
EIS	environmental impact statement
EMT	Early Period-Middle Period Transition
EPA	U.S. Environmental Protection Agency
ESL	Environmental Screening Levels
F	Fahrenheit
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
g	the acceleration resulting from gravity, or 9.81 meters per second squared (seismicity)
General Construction Permit	State Water Resources Control Board's General Permit for Discharges of Storm Water Associated with Construction and Land Disturbance Activities
GHG	greenhouse gas
Greenbelt	John W. Christian Greenbelt
h:v	horizontal run to vertical rise
HM	hydromodification management
HMCD	Santa Clara County Hazardous Materials Compliance Division
HMCU	Hazardous Materials Compliance Unit
Hwy	U.S. Highway

I-	Interstate
in/sec	inches per second
IPCC	Intergovernmental Panel on Climate Change
IS	Initial Study Checklist
ITR	Industrial To Residential
JPB	Peninsula Corridor Joint Powers Board
KOP	key observation point
lbs/day	pounds per day
L_{dn}	day-night level
L_{eq}	equivalent sound level
L_{max}	maximum sound levels
LOS	Level of Service
LUFT	leaking underground fuel tank
MGD	million gallons per day
MM	mitigation measure
Model	Road Construction Emissions Model
Moffet Field	Moffett Federal Air Field
MTCO _{2e}	metric tons of carbon dioxide equivalent
N ₂ O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAHC	California Native American Heritage Commission
NEPA	National Environmental Policy Act
NFP	Natural Flood Protection
NHPA	National Historic Preservation Act
NHTSA	National Highway Traffic Safety Administration
NOP	notice of preparation
NOx	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NTU	nephelometric turbidity units
NWIC	Northwest Information Center
OHP	California Office of Historic Preservation
PAHs	polyaromatic hydrocarbons
PCBs	polychlorinated biphenyls
PCE	perchloroethene
PG&E	Pacific Gas and Electric Company
PM _{2.5}	particulates less than 2.5 microns in diameter
PM ₁₀	particulates less than 10 microns in diameter

Porter-Cologne Act	Porter-Cologne Water Quality Control Act
PPV	peak particle velocity
PRC	California Public Resources Code
Project or Proposed Project	Sunnyvale East and West Channels Flood Protection Project
RCNM	roadway construction noise model
Refuge	Don Edwards San Francisco Bay National Wildlife Refuge
ROG	reactive organic gas
ROW	right-of-way
ROWD	Report of Waste Discharge
RSP	rock slope protection
RWQCB	Regional Water Quality Control Board
San Francisco Bay RWQCB	San Francisco Bay Regional Water Quality Control Board
SCCHMCD	Santa Clara County Hazardous Materials Compliance Division
SCSP	sacked concrete slope protection
SCUSD	Santa Clara Unified School District
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SFBAAB	San Francisco Bay Area Air Basin
SFPUC	San Francisco Public Utility Commission
SHMA	Seismic Hazards Mapping Act
SHPO	State Historic Preservation Officer
SLIC	Spills, Leaks, Investigations, and Cleanup
SMaRT	Sunnyvale Materials Recovery and Transfer
SMC	Sunnyvale Municipal Code
SMP	Stream Maintenance Program
sq. mi.	square mile(s)
SQSP	Soil Quality Sampling Plan
SR	State Route
Sunnyvale Channels	Sunnyvale East and West Channels
SWRCB	State Water Resources Control Board
TCE	temporary construction easement
TCE	trichloroethylene
TIA	Transportation Impact Analysis
Title 2	Title 27, CCR, Section 20005 et seq.
TMDL	Total Maximum Daily Load
TOC	total organic carbon
TPH	total petroleum hydrocarbon
UPRR	Union Pacific Railroad
USA North	Underground Service Alert of Northern California and Nevada
USACE	U.S. Army Corps of Engineers

USC	U.S. Government Code
USFWS	U.S. Fish and Wildlife Service
V/C	volume-to-capacity
VdB	vibration velocity level or vibration decibel level
VOC	volatile organic compound
VRM	Visual Resource Management
VTA	Santa Clara Valley Transportation Authority
Waters of the U.S.	Waters of the United States
WDR	Waste Discharge Requirements
West Channel	Sunnyvale West Channel
WPCP	Water Pollution Control Plant
WQSP	Water Quality Sampling Plan

Executive Summary

Introduction

The Santa Clara Valley Water District (District) prepared this Draft Environmental Impact Report (DEIR) to provide the public, responsible agencies, and trustee agencies with information about the potential environmental effects of the proposed Sunnyvale East and West Channels Flood Protection Project (Project or Proposed Project). This DEIR was prepared in compliance with the California Environmental Quality Act (CEQA) of 1970 (as amended) and the State CEQA Guidelines (California Code of Regulations [CCR] title 14, section (§) 15000 et seq.).

Proposed Project Overview

The Proposed Project was initiated under the District's Clean, Safe Creeks and Natural Flood Protection (CSC) Plan to provide 100-year riverine flood protection to approximately 1,618 properties and 47 acres within the City of Sunnyvale. The CSC Plan was approved by Santa Clara County voters in November 2000 to create a countywide special parcel tax. Revenues from the CSC Plan are allocated toward obtaining the following four major outcomes over the 15-year period from 2001 through 2016:

1. Flood protection for homes, schools, businesses and transportation
2. Clean, safe water in Santa Clara County creeks and bays
3. Healthy creek and bay ecosystems, and
4. Trails, parks and open space along waterways.

Proposed Project Objectives

The Proposed Project involves constructing a series of infrastructure upgrades to provide additional flood protection and improve water quality. The Proposed Project is intended to meet the following objectives:

- Provide riverine flood protection where historic flooding has occurred and future flooding is possible from a 100-year storm event (1% risk of occurring any year);
- Provide a basis to update FEMA flood hazard maps upon completion of the Proposed Project to reflect 100-year riverine flood protection along the improved channels and reduce or eliminate flood insurance requirements in the communities surrounding the Sunnyvale Channels;

- Provide infrastructure improvements beyond 100-year riverine flood protection as necessary to meet the District's freeboard standards;
- Provide water quality improvements by repairing/stabilizing existing erosion sites; and
- Provide recommendations for recreational enhancements in coordination with flood and water quality improvements.

The District intends to complete construction on both Sunnyvale Channels by December 31, 2015, 1 year earlier than the target schedule objectives of the CSC Plan.

Project Location

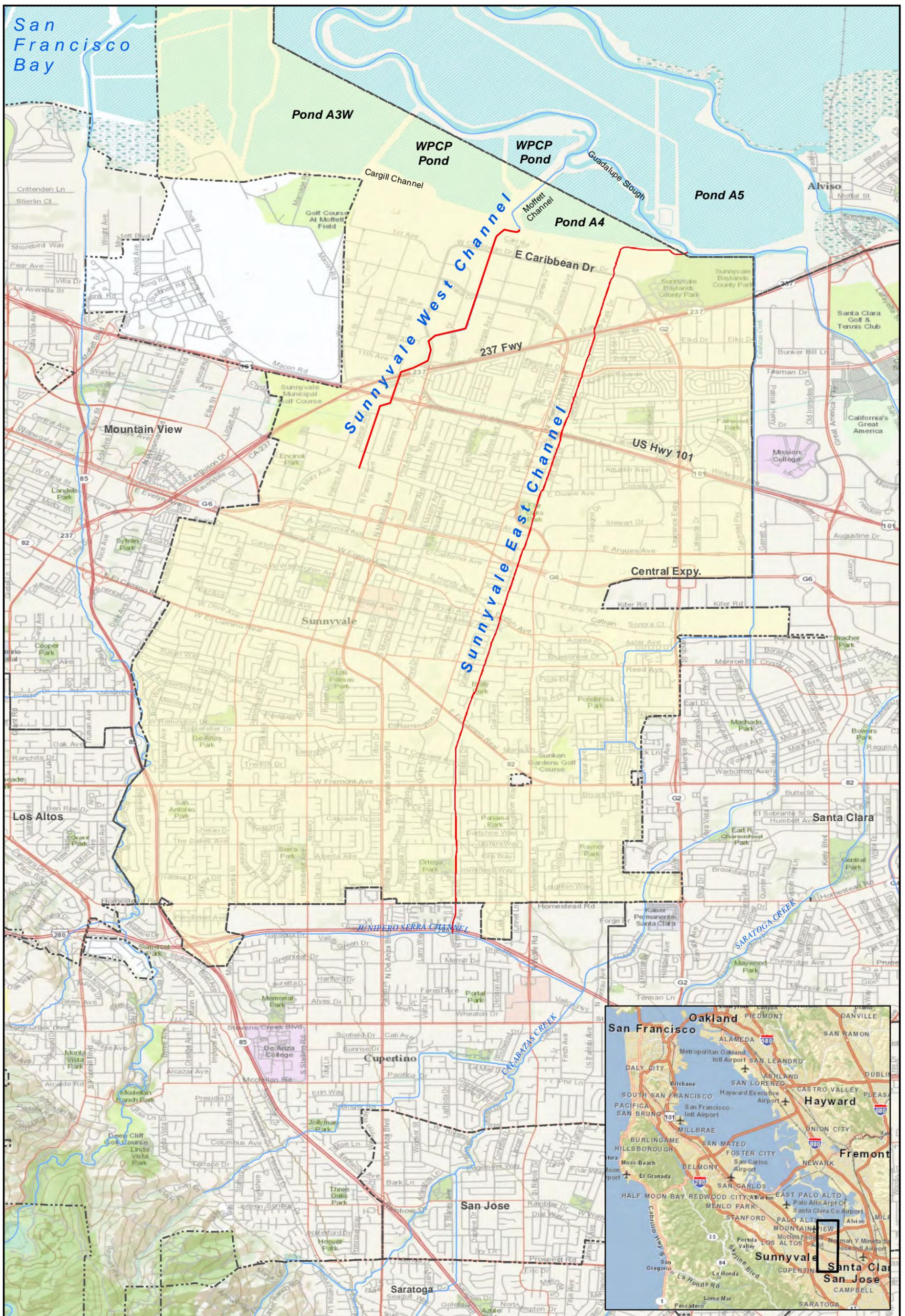
The Sunnyvale Channels flow northward through the City of Sunnyvale, as shown in **Figure ES-1**. At the northern end of the Project Area, toward San Francisco Bay, the channels discharge to the Guadalupe Slough adjacent to Pond A4. In the downstream reaches near San Francisco Bay the channels receive tidal backwatering from Guadalupe Slough and can also receive flows from nearby Calabazas and San Tomas Aquino Creeks. The Sunnyvale East Channel (East Channel) extends approximately 6.5 miles upstream from the Bay and drains a watershed of approximately 7.25 square miles. The Sunnyvale West Channel (West Channel) extends approximately 3 miles from the Bay and drains a watershed of approximately 7.6 square miles.

Project Planning and Development

The District developed several initial Project concepts to meet the District's CSC Plan and Project's specific objectives. Conceptual alternatives were evaluated and refined based on the District's Natural Flood Protection (NFP) evaluation process and a risk assessment. The District developed project features to address locations susceptible to riverine flooding from a 100-year flood event, areas of freeboard deficiency, and sites with actively eroding channel banks.

Project Refinement to Avoid Environmental Impacts

The identified preferred alternative was refined through the planning, design engineering, and CEQA process to avoid or reduce potential environmental effects and address public input. District staff initially recommended an alternative that combined floodwalls, levees, and use of Pond A4 as a detention basin. The Pond A4 alternative was rejected, due to concerns of water quality impacts. During the Project refinement phase, the District revised the Project further to avoid impacts to wetlands, aesthetics, recreation, Salt Marsh Harvest Mouse Habitat, and wildlife corridors from floodwall and levee features.

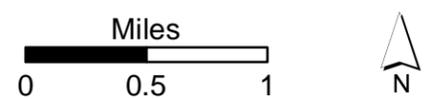


- Project Channels
- Creeks
- Sunnyvale City Limits

Note: WPCP = Sunnyvale Water Pollution Control Plant

Source: SCVWD 2012; Bing Maps

Figure ES-1
Sunnyvale East and West Channels
Flood Protection Project Site



Prepared for Santa Clara Valley Water District

October 2013

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Proposed Project

The Proposed Project consists of a series of flood protection and water quality improvements. The Project design complies with FEMA's and the District's freeboard standards. Freeboard is essentially a safety measure taken to reduce the risk from flood events. Project flood protection and freeboard improvements include floodwalls, levee and maintenance road improvements, bridge/culvert modifications, and sediment removal. The Project also includes repairing and stabilizing several streambank sections that are unstable and actively eroding. **Table ES-1** summarizes the main project features. Figures 2-2a through 2-2i in the Chapter 2 Project Description illustrate the locations of these Proposed Project features.

Table ES-1. Overview of Proposed Project Components

Proposed Project Component	Description
Floodwalls	Vertical floodwalls would be constructed along existing maintenance roads, parallel to the channels, on either the inboard side (between the maintenance road and the channel) or outboard side (outside of the channel and the maintenance road).
Levee Modifications	A few existing levees would be modified to increase flood protection and freeboard. Existing levees at the downstream ends of the East and West Channels would be raised, but not widened. Existing levees would also be enlarged (raised and widened) on the East and West Channels.
Maintenance Road Modifications	Existing maintenance roads along the Sunnyvale Channels would be raised or resurfaced with new base rock. If the City of Sunnyvale enters into a Joint Use Agreement with the District, the District may pave several stretches of its existing gravel maintenance roads for recreational use.
Bridge/Culvert Modifications	Bridges/culverts would be modified at several roadway crossings to increase stream flow capacity and reduce historic bridge overtopping and culvert backwatering. Two existing bridges/culverts would be reconstructed; both culverts would be extended; and existing headwalls would be raised at several crossings.
Rock Slope Protection	Eroding stream banks, as well as stream banks vulnerable to erosion would be stabilized with rock material at the base of the stream bank. Rock would extend up the bank slopes to the top of bank where 1.5:1 (horizontal:vertical) sloped banks are present, up to 10-year flood event water level where 2:1 (horizontal:vertical) sloped banks are present, or in tidal reaches up to the mean higher high-water level.
Other Modifications	Culvert outfall locations would be stabilized with small concrete spans. A concrete trapezoidal channel would be constructed within an existing highly erosive reach on the East Channel.
Property Acquisitions	Temporary construction or permanent easements would be obtained from several parcels along both Sunnyvale Channels.
Sediment Removal	Sediment would be removed from four locations along the East Channel, and one location on the West Channel where excessive sediment has aggregated over time and reduced channel capacity.

Project Construction

The Project Work Area consists of the channels, channel easements and the District's existing right of way, and proposed property acquisitions including temporary construction staging areas.

Construction of the Proposed Project is planned to take place over the summers of 2014 and 2015. Work is planned to begin around May 1st and last through about November 1st in both years. In-channel work is planned for the driest time of the year, between approximately June 1st and October 1st or as otherwise allowed by Project regulatory permits. Construction would be conducted by several workers in multiple crews, working on both channels concurrently.

Construction activities common to several Project features include shallow excavation from the channel banks and bed and channel easements, resurfacing of existing rock maintenance roads, installation of new rock on the channel banks and bed, installation of concrete and concrete slurry in the channel, demolition of existing channel protection hardscape features, and installation of concrete at bridge/culvert crossings.

A variety of construction materials would be imported to and exported from the Project Area during construction activities. Soil/sediment excavated during Project construction is proposed for on-site reuse for other Project components. Several utilities would be protected in place or temporarily relocated during construction activities.

Best Management Practices

During Project construction, the District would incorporate a range of best management practices (BMPs) to avoid and minimize undesired effects on the environment. BMPs are used by the District for construction projects and have been customized for the Proposed Project, as necessary, to ensure that the intended goal of measure is achieved. BMPs are designed to address anticipated effects of certain work activities on particular types of resources.

Channel Maintenance Activities

Following Project construction, future routine maintenance activities at the Sunnyvale Channels may include trash and debris removal, vegetation management, graffiti removal, bank repairs, and minor sediment removal to periodically clear culverts. These activities are similar and consistent with the District's stream maintenance activities that have been conducted at the Sunnyvale Channels in past years. Because the Proposed Project includes repairing destabilized streambanks at several locations along the Sunnyvale Channels, this would reduce future maintenance needs including sediment removal and bank repairs. None of the Proposed Project activities are expected to increase maintenance needs. Rather, the Proposed Project is anticipated to result in less maintenance.

Permits and Approvals

Table ES-1 provides a list of agencies and applicable permits, approvals, and consultations that are anticipated for the Proposed Project. Project information and environmental analyses contained within the EIR will be used by these agencies for decision making on issues related to their jurisdiction and applicable regulations.

Table ES-1. Proposed Project Regulatory Permits, Approvals and Consultations

Agency	Permit / Approval / Consultation	Project Activities
Federal Agencies		
U.S. Army Corps of Engineers	Section 404 Clean Water Act - Permit	Placement of rock in the channel
U.S. Fish and Wildlife Service	Section 7 Federal Endangered Species Act – Section 7 Consultation	Various construction activities
National Marine Fisheries Service/ NOAA Fisheries	Section 7 Federal Endangered Species Act – Section 7 Consultation	Construction within the Sunnyvale Channels
	Magnuson-Stevens Act – Essential Fish Habitat Assessment	Construction within the Sunnyvale Channels
State Agencies		
California Department of Fish and Game	Sections 1600 California Fish and Game Code - Streambed Alteration Agreement	Construction within the Sunnyvale Channels
California State Water Resources Control Board	Section 402 Clean Water Act - Stormwater General Construction Permit	Construction related ground disturbances
San Francisco Bay Regional Water Quality Control Board (Region 2)	Section 401 of the Clean Water Act - Water Quality Certification; and Porter- Cologne Water Quality Control Act – Waste Discharge Requirements	Placement of rock in the channel; potential discharge of pollutants during construction activities
San Francisco Bay Conservation and Development Commission	McAteer-Petris Act – Development Permit	Development of Project components along the south San Francisco Bay Shoreline
California Department of Transportation (Caltrans)	Encroachment Permit	Construction on state highways/within Caltrans right-of-way
Local Agencies		
City of Sunnyvale	Municipal Code Section 13.08.030 – Encroachment Permit	Permanent and temporary acquisition of easements from City of Sunnyvale
	Municipal Code Section 13.16.060 – Tree Removal Permit	Removal of City of Sunnyvale trees during construction
	Municipal Code Section 10.40.080 – Truck Traffic	Temporary traffic controls and lane closures, and equipment haul routes on City of Sunnyvale streets.

Public Involvement Process

Scoping Comment Period

In accordance with State CEQA Guidelines (14 CCR 15082[a], 15103, 15375), the District circulated a Notice of Preparation (NOP) of an EIR for the Proposed Project on January 15, 2013 (provided as **Appendix A**). The NOP was circulated to the public; to the California Office of Planning and Research; to responsible, trustee, and other relevant local, state, and federal agencies; and to other interested parties of the public. The District held an informational public scoping meeting on January 24, 2013, at Fairwood Elementary School in Sunnyvale. Prior to the meeting the District mailed meeting announcement notices to those who received the NOP and interested parties who signed up for the receipt of Project-related information at previous public meetings.

The District also prepared an Initial Study Checklist (IS) for the Proposed Project and circulated the IS for public review along with the NOP (also included as part of Appendix A). The IS evaluated potential environmental impacts associated with the Proposed Project based on preliminary Project information. The District determined in the IS that several potential environmental impacts associated with the Proposed Project did not have the potential to be significant – those impacts were found to be “less than significant” or to have “no impact” – and could be dismissed from further evaluation in this EIR. Comments received in response to the NOP/IS and scoping meeting are included in this EIR as **Appendix B**. Concerns raised during the scoping period were considered during preparation of this DEIR.

Draft EIR Comment Period

The District is now circulating this DEIR for a 45-day public review and comment period and will host a public hearing during this period. The purpose of public circulation and the public hearings are to provide agencies and interested individuals with opportunities to comment on the contents of the DEIR.

For those interested, written comments or questions concerning this DEIR should be submitted within this review period and directed to the name and address listed below. Please submit your response at the earliest possible date, but no later than 45 days from release of the DEIR.

Tiffany Hernandez
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118
(408) 265-2607 ext. 3094
thernandez@valleywater.org

All documents mentioned herein or related to this project can be reviewed on any District business day between the hours of 7:30 a.m. and 5:00 p.m., Monday through Thursday, at the District's headquarters building, located at 5750 Almaden Expressway, San Jose, CA 95118. Please contact Ms. Tiffany Hernandez at (408) 630-3094 to request the documents you wish to review and to arrange a date and a time for said review. In addition, the District has developed a Web page dedicated to the Proposed Project where individuals can access Project documents and keep informed of the overall progress and upcoming scheduled events:

<http://www.valleywater.org/service/SunnyvaleEastandWest.aspx>.

Written comments received in response to the DEIR will be addressed in a Response to Comments document (the Final EIR), which, together with the DEIR, will constitute the entire EIR.

Preparation of Final EIR and Public Hearing

CEQA requires the lead agency to prepare a Final EIR, addressing all substantive comments received on the DEIR before approving a project. The Final EIR must include a list of all individuals, organizations, and agencies that provided comments on the DEIR, and must contain copies of all comments received during the public review period along with the lead agency's responses.

After review of the Final EIR, District staff will recommend to the District's Board of Directors whether to approve or deny the Proposed Project. This governing body then will review the Final EIR, consider District staff's recommendations and public testimony, and decide whether to certify the Final EIR and approve or deny the Proposed Project.

If significant impacts are identified in the EIR and cannot be mitigated, a statement of overriding considerations must be included in the record of the Proposed Project approval and mentioned in the Notice of Determination, to be filed with the State Office of Planning and Research and at the office of the County Clerk (14 CCR 15093[c]).

Areas of Known Controversy

No areas of public concern have been identified regarding the Proposed Project.

Summary of Impact Analysis

This section summarizes conclusions regarding significant Project impacts that are identified in the DEIR. This is not a comprehensive discussion of impacts. **Table ES-2**, Summary of Impacts and Mitigation Measures, is provided at the end of this chapter as an additional summary reference. The reader is directed to the remainder of this EIR to review the

complete discussion of these topics. Chapter 3, “Environmental Setting and Impact Analysis” and Chapter 4, “Other Statutory Considerations” of this DEIR address the following environmental resource topics and the impacts of the Proposed Project.

- Aesthetics
- Air Quality
- Biological Resources
- Cultural Resources
- Geology and Soils
- Greenhouse Gas Emissions
- Hazards and Hazardous Materials
- Hydrology, Geomorphology & Water Quality
- Land Use and Planning
- Noise and Vibrations
- Recreation
- Transportation/Traffic
- Utilities and Service Systems

Significant and Unavoidable Impacts

The following impacts have been identified as significant and unavoidable:

- **Impact AIR-3:** Result in a Cumulatively Considerable Net Increase of any Criteria Pollutant for Which the Project Region is Non-Attainment
- **Impact NO-2:** Temporary Groundborne Vibration Resulting in Building Damage or Annoyance in the Project Area
- **Cumulative Impact AIR-1:** Temporary Cumulative Increase in NOx, ROG, and Exhaust and Particulate Matter PM10 and PM2.5 from Construction Activities

Alternatives Considered

The following alternatives were evaluated for their feasibility and their ability to achieve most of Project objectives while avoiding, reducing, or minimizing significant impacts identified for the Proposed Project:

- No Project Alternative
- Pond A4 Detention Basin Alternative
- Flood Protection Improvements Only Alternative
- Increased Construction Phasing Alternative

No Project Alternative

In the No Project Alternative, none of the components of the Proposed Project would be constructed, including no flood protection improvements, erosion repairs, sediment removal, or any other components. No construction activities would occur, and the Project Area would remain in its current condition. This alternative would not provide flood protection for areas surrounding the Sunnyvale Channels. Repair of eroding channel banks would not occur,

thus long-term water quality benefits resulting from reduced sediment loading after bank repairs under the Proposed Project would not be realized.

Pond A4 Detention Basin Alternative

The Pond A4 Detention Basin Alternative reroutes both Sunnyvale Channels to discharge into Pond A4 instead of the Guadalupe Slough. Pond A4 would be used as a flood detention basin for temporary storage of flood flows. Therefore, the vertical height of floodwalls, levees, and headwalls, would not be as high compared to the Proposed Project. Otherwise, this alternative is similar to the Proposed Project. This alternative and the Proposed Project provide the same level of flood protection. Temporary construction-related impacts are not expected to differ much between this alternative and the Proposed Project. However, significant impacts on water quality in Guadalupe Slough and biological resources at Pond A4 and Guadalupe Slough may occur under this alternative. This alternative would not reduce the significant air quality and vibration impacts identified under the Proposed Project.

Flood Protection Only Alternative

The Flood Protection Only Alternative would construct only the components of the Proposed Project that provide flood protection, namely floodwalls, levee enlargements, and bridge and culvert modifications. Channel improvements, including erosion repairs, concrete channel lining, and wingwall and outfall bank stabilizations, and maintenance road improvements would not be developed under this alternative. With this alternative, certain construction-related impacts would be less than with the Proposed Project as a result of the reduced intensity and duration of construction, including those related to: biological resources, hazardous materials, water quality, traffic, air pollutant emissions, and groundborne vibrations. This alternative would not reduce the significant air quality impacts identified under the Proposed Project.

Increased Construction Phasing Alternative

The Increased Construction Phasing Alternative would construct the same components as the Proposed Project, but the components would be constructed over 4 years instead of two years as would occur under the Proposed Project. The extended construction period would reduce the concentration of construction activities occurring each day and thus reduce average daily emissions of air quality contaminants, particularly NO_x, below BAAQMD thresholds. Traffic patterns would be disrupted more frequently under this alternative due to the longer construction period. Other temporary construction impacts, such as those related to aesthetics, groundborne vibrations, and potential exposure and release of contaminated soil and groundwater, would be the same significance level as the Proposed Project but would occur on a different construction timeline.

Comparison of Alternatives and the Environmentally Superior Alternative

The No Project Alternative is considered to be the environmentally superior alternative, because it would not result in construction or operational environmental impacts.

When the No Project alternative is the environmentally superior alternative, CEQA requires that an environmentally superior alternative be selected from among the other alternatives to the Proposed Project (CEQA Guidelines Section 15126.6(e)(2)). These other alternatives can be referred to as “action alternatives” compared to the No Project Alternative. The Increased Construction Phasing Alternative would generally result in similar constructed-related impacts as the Proposed Project, but project-level and cumulative air quality emissions would be reduced below significance thresholds. Though flood protection benefits would be realized over a longer timeframe, this alternative would meet all the Proposed Project goals. For these reasons, the Increased Construction Phasing Alternative is considered the environmentally superior alternative, compared to the other alternatives to the Proposed Project.

The other action alternatives were not selected as the environmentally superior alternative for the following reasons:

- **Pond A4 Detention Basin Alternative.** This alternative would meet all the project objectives, but would result in increased water quality and biological resource impacts in sensitive tidal habitats compared with the Proposed Project and the Increased Construction Phasing Alternative. Significant impacts on air quality and groundborne vibration would not be reduced under this alternative.
- **Flood Protection Only Alternative.** This alternative would reduce potential temporary impacts on water quality and biological resources due to no ground disturbing activities being conducted in the channel. However, long-term water quality and biological resource impacts would potentially increase due to continued erosion and sedimentation from the lack of channel bank maintenance. Significant impacts on air quality and groundborne vibration would not be reduced under this alternative.

Summary of Impacts and Levels of Significance

The impacts of the Proposed Project, proposed mitigation, and significance conclusions are discussed in detail in Chapter 3, *Environmental Setting and Impact Analysis* and Chapter 4, *Other Statutory Considerations*. **Table ES-2** summarizes the impacts, mitigation measures, and levels of significance identified in this document.

Table ES-2. Summary of Potential Impacts and Mitigation Measures

Impact	Level of Significance Before Mitigation ¹	Mitigation Measure (MM)	Level of Significance After Mitigation
3.1 Aesthetics			
Impact AES-1: Temporary Visual Impacts Resulting from Construction Activities	PS	MM AES-1: Provide Visual Screening for Construction Staging Areas in Open Space Baylands and Residential Zones. MM AES-2: Minimize Fugitive Light from Portable Sources of Light Used for Construction.	LTS
Impact AES-2: Permanent Alteration of the Visual Character or Quality of the Project Site, Including Scenic Vistas from Floodwalls	LTS	None required.	LTS
Impact AES-3: Permanent Alteration of the Visual Character or Quality of the Project Site, Including Scenic Vistas, from Project Components other than Floodwalls	LTS	None required.	LTS
Impact AES-4: Creation of a New Source of Light or Glare	LTS	None required..	LTS
3.2 Air Quality			
Impact AIR-1: Conflict with or Impair Implementation of Applicable Air Quality Plans	LTS	None required.	LTS
Impact AIR-2: Exceed Any Air Quality Standard by Failing to Adhere to Assumptions Used in the Preparation of any Air Quality Plans	LTS	None required.	LTS
Impact AIR-3: Result in a Cumulatively Considerable Net Increase of any Criteria Pollutant for Which the Project Region is Non-Attainment	SU	MM AQ-1: Restrict Construction Equipment Idling Times MM AQ-2: Construction Equipment Maintenance MM AQ-3: Use of Efficient Construction Equipment	SU

Impact	Level of Significance Before Mitigation ¹	Mitigation Measure (MM)	Level of Significance After Mitigation
Impact AIR-4: Expose Sensitive Receptors to Substantial Pollutant Concentrations	LTS	None required.	LTS
Impact AIR-5: Create Objectionable Odors Affecting a Substantial Number of People	LTS	None required.	LTS
3.3 Biological Resources			
Impact BIO-1: Loss or Temporary Disturbance of Wetlands and Other Waters	PS	MM BIO-1: Implement Compensatory Mitigation for Temporal Loss of Vegetated Wetlands and Permanent Loss of Vegetated and Unvegetated Wetlands and Other Waters	LTS
Impact BIO-2: Impacts on Green Sturgeon, Steelhead, and Longfin Smelt	PS	MM BIO-1: Implement Compensatory Mitigation for Temporal Loss of Vegetated Wetlands and Permanent Loss of Vegetated and Unvegetated Wetlands and Other Waters MM BIO-2: Conduct Fish Removal during Project Site Dewatering Activities	LTS
Impact BIO-3: Impacts on Non-Special Status Fish and Amphibians	LTS	None required.	LTS
Impact BIO-4: Impacts on Essential Fish Habitat	LTS	None required.	LTS
Impact BIO-5: Impacts on Western Pond Turtles	PS	MM BIO-3: Conduct Pre-Construction Surveys for Western Pond Turtles	LTS
Impact BIO-6: Impacts on the California Clapper Rail and California Black Rail	LTS	None required.	LTS
Impact BIO-7: Impacts on the White-tailed Kite, Loggerhead Shrike, and Bryant's Savannah Sparrow	PS	MM BIO-4: Pre-Construction Surveys for Nesting Birds MM BIO-5: Implement Buffer Zones for Nesting Birds	LTS

Impact	Level of Significance Before Mitigation ¹	Mitigation Measure (MM)	Level of Significance After Mitigation
Impact BIO-8: Impacts on Burrowing Owls	PS	MM BIO-6: Conduct Pre-Construction Surveys for Burrowing Owls MM BIO-7: Implement Buffer Zones for Burrowing Owls MM BIO-8: Monitor Owls during Construction MM BIO-9: Passively Relocate Burrowing Owls MM BIO-10: Restoration of Temporary Impact Areas MM BIO-11: Compensatory Mitigation for Burrowing Owls	LTS
Impact BIO-9: Impacts on the Alameda Song Sparrow and San Francisco Common Yellowthroat	PS	MM BIO-4: Pre-Construction Surveys for Nesting Birds MM BIO-5: Implement Buffer Zones for Nesting Birds	LTS
Impact BIO-10: Impacts on Non-Special-Status Birds	PS	MM BIO-4: Pre-Construction Surveys for Nesting Birds MM BIO-5: Implement Buffer Zones for Nesting Birds	LTS
Impact BIO-11: Impacts on Salt Marsh Harvest Mouse and Salt Marsh Wandering Shrew	PS	MM BIO-12: Maintain Buffer during Construction Adjacent to Salt Marsh Harvest Mouse and Salt Marsh Wandering Shrew Habitat	LTS
Impact BIO-12: Impacts on Bats	PS	MM BIO-13: Avoid Construction during Bat Maternity Season	LTS
Impact BIO-13: Impacts on Other Non-Special-Status Species	LTS	None required.	LTS
Impact BIO-14: Impacts on Wildlife Movement Corridors	LTS	None required.	LTS

Impact	Level of Significance Before Mitigation ¹	Mitigation Measure (MM)	Level of Significance After Mitigation
3.4 Cultural Resources			
Impact CUL-1: Potential Discovery and Adverse Effect on Unknown Historic or Archaeological Resources	LTS	None required.	LTS
Impact CUL-2: Potential Discovery and Adverse Effect on Paleontological Resources	LTS	None required.	LTS
3.5 Geology and Soils			
Impact GEO-1: Potential Adverse Effects from Fault Rupture, Earthquake-Induced Liquefaction, Seismic Settlement, or Channel Slope and Levee Instability	LTS	None required.	LTS
Impact GEO-2: Soil Erosion and Loss of Topsoil from Project Construction Activities	LTS	None required.	LTS
3.6 Greenhouse Gas Emissions			
Impact GHG-1: Temporary Increase in GHG Emissions from Project Construction Activities	LTS	None required.	LTS
Impact GHG-2: Conflict with an Applicable Plan, Policy or Regulation of an Agency Adopted for the Purpose of Reducing GHG Emissions from Project Construction Activities	LTS	None required.	LTS
3.7 Hazards and Hazardous Materials			
Impact HM-1: Potential Release of Existing Contaminated Soil and Groundwater Discovered during Project Construction Activities and Resulting Exposure to Construction Workers, the Public, or the Environment	PS	MM HM-1: Conduct a Phase I and Phase II Environmental Site Assessments and Implement Site Remediation Actions Prior to Construction.	LTS
Impact HM-2: Creation of Hazards Potentially Affecting the Public or the Environment from the Use of Oil, Gasoline, or Other Hazardous Materials during Construction Activities	LTS	None required.	LTS

Impact	Level of Significance Before Mitigation ¹	Mitigation Measure (MM)	Level of Significance After Mitigation
Impact HM-3: Emission or Handling of Hazardous Materials in Proximity to Schools	PS	MM HM-1: Conduct Phase I and Phase II Environmental Site Assessments and Implement Site Remediation Actions Prior to Construction.	LTS
3.8 Hydrology, Geomorphology and Water Quality			
Impact HYD/WQ-1: Effects on Erosion, Sedimentation, or Stream Instability from the Proposed Project	LTS	None required.	LTS
Impact HYD/WQ-2: Changes in Surface Runoff from New Impervious Surfaces for Maintenance Road Improvements	LTS	None required.	LTS
Impact HYD/WQ-3: Water Quality Impacts due to Discharge of Contaminated Soil or Groundwater	PS	MM HM-1: Conduct a Phase I and Phase II Environmental Site Assessments and Implement Site Remediation Actions Prior to Construction	LTS
3.9 Land Use and Planning			
Impact LU-1: Project Property Acquisitions Conflicts with Applicable Land Use Plans or Policies	LTS	None required.	LTS
Impact LU-2: Project Tree Removal Conflicts with Applicable Land Use Plans or Policies	LTS	None required.	LTS
3.10 Noise and Vibration			
Impact NO-1: Temporary Generation of Construction Noise in the Project Area in Excess of Applicable Standards	LTS	None required.	LTS
Impact NO-2: Temporary Groundborne Vibration Resulting in Building Damage or Annoyance in the Project Area	SU	MM NO-1: Implement Measures to Minimize Construction Vibration.	SU
Impact NO-3: Temporary Increase in Ambient Noise Levels of the Project Area	LTS	None required.	LTS

Impact	Level of Significance Before Mitigation ¹	Mitigation Measure (MM)	Level of Significance After Mitigation
Impact NO-4: Permanent Alteration of Ambient Noise Levels from Project Floodwall and Headwall Components	LTS	None required.	LTS
3.11 Recreation			
Impact REC-1: Temporary Disturbance of Recreational Areas during Project Construction Resulting in a Loss or Deterioration of Recreational Opportunities	LTS	None required.	LTS
Impact REC-2: Permanent Loss or Deterioration of Public Recreational Opportunities Resulting from the Proposed Project	LTS	None required.	LTS
3.12 Transportation/Traffic			
Impact TR-1: Temporary Construction Traffic Generation in Exceedance of Roadway LOS Standards or Substantial Increase in Traffic	PS	MM TR-1: Develop and Implement a Site-Specific Traffic Control Plan	LTS
Impact TR2: Temporary Substantial Increase in Safety Hazards	PS	MM TR-1: Develop and Implement Site-Specific Traffic Control Plan	LTS
Impact TR-3: Temporary Increases in Emergency Response Times	PS	MM TR-1: Develop and Implement Site-Specific Traffic Control Plan	LTS
Impact TR-4: Temporary Reduction in Parking Capacity	LTS	None required.	LTS
Impact TR-5: Temporary Conflicts with Alternative Transportation	PS	MM TR-1: Develop and Implement Site-Specific Traffic Control Plan	LTS

Impact	Level of Significance Before Mitigation ¹	Mitigation Measure (MM)	Level of Significance After Mitigation
3.13 Utilities and Service Systems			
Impact UTL-1: Temporary Disruptions to Water, Wastewater, Stormwater, Power Systems and Other Utility Systems during Project Construction Activities	PS	MM UTL-1: Existing Utilities will be Identified and Coordination will be Conducted with Utility Owners before Construction MM UTL-2: Existing Utilities will be Protected during Construction. MM UTL-3: Utility Customers will be Notified before Construction Activities Commence. MM UTL-4: A Safety and Health Program will be Prepared and Implemented.	LTS
Impact UTL-2: Adequate Landfill Capacity to Accommodate Solid Waste from Construction	LTS	None required.	LTS
Impact UTL-3: Temporary Effects on Operational Vehicle Access to the City of Sunnyvale SMaRT Station and Water Pollution Control Plant (and Associated Facilities)	LTS	None required.	LTS
4.0 Cumulative Impacts			
Cumulative Impact AIR-1: Temporary Cumulative Increase in NOx, ROG, and Exhaust and Particulate Matter PM ₁₀ and PM _{2.5} from Construction Activities	SU	MM AQ-1 through MM AQ-3. See mitigation measures listed above.	SU
Cumulative Impact BIO-1: Cumulative Impact on Biological Resources	PS	MM BIO-1 through MM BIO-13. See mitigation measures listed above.	LTS
Cumulative Impact GHG-1: Temporary Cumulative Increase in Greenhouse Gases from Construction Activities	LTS	None required.	LTS
Cumulative Impact NO-1: Exposure of Noise-sensitive Land Uses to Temporary Increases in Noise and Vibrations	LTS	None required.	LTS

Impact	Level of Significance Before Mitigation ¹	Mitigation Measure (MM)	Level of Significance After Mitigation
Cumulative Impact HM-1: Impacts on Existing Hazards	PS	MM HM-1: Conduct Phase I and Phase II Environmental Site Assessments and Implement Site Remediation Actions Prior to Construction.	LTS
Cumulative Impact REC-1: Impacts on Recreation	LTS	None required.	LTS
Cumulative Impact TR-1: Disruption of Traffic Patterns	PS	MM TR-1: Develop and Implement a Site-Specific Traffic Control Plan.	LTS
Cumulative Impact WQ-1: Impacts on Water Quality	PS	MM HM-1: Conduct Phase I and Phase II Environmental Site Assessments and Implement Site Remediation Actions Prior to Construction.	LTS

¹ Definitions:

- LTS Less than Significant
- PS Potentially Significant
- SU Significant and Unavoidable

Chapter 1

Introduction

The Santa Clara Valley Water District (District) has prepared this Environmental Impact Report (EIR) to provide the public, responsible agencies, and trustee agencies with information about the potential environmental effects of the proposed Sunnyvale East and West Channels Flood Protection Project (Project or Proposed Project). This Draft EIR (DEIR) was prepared in compliance with the California Environmental Quality Act (CEQA) of 1970 (as amended) and the State CEQA Guidelines (California Code of Regulations [CCR] title 14, section (§) 15000 et seq.).

1.1 General Background

The District is a special district created by the State Legislature. The District is responsible for water supply, flood protection, and stream stewardship in Santa Clara County, California. The District manages streams, canals, reservoirs, dams, pipelines, groundwater percolation facilities, and water treatment plants throughout the county to fulfill its responsibilities. The District carries out its responsibilities in an environmentally responsible and cost-effective manner, led by a Board of Directors composed of seven members, each elected from geographical areas within the county.

As Santa Clara County's (County's) water wholesaler, the District ensures a dependable supply of clean, safe water for homes and businesses. As the agency responsible for local flood protection, the District works diligently to protect Santa Clara Valley residents and businesses from the devastating effects of flooding. The District's stream stewardship includes creek restoration and wildlife habitat projects, mitigation monitoring, pollution prevention efforts, and a commitment to natural flood protection.

1.2 Project Background

The Proposed Project was initiated under the District's Clean, Safe Creeks and Natural Flood Protection (CSC) Plan to provide 100-year riverine flood protection to approximately 1,618 properties and 47 acres within the City of Sunnyvale.

1.2.1 Clean, Safe Creeks and Natural Flood Protection Plan

The CSC Plan was approved by Santa Clara County voters in November 2000 to create a countywide special parcel tax. Revenues from the CSC Plan are allocated toward obtaining the following four major outcomes over the 15-year period from 2001 through 2016 (SCVWD 2013):

1. Flood protection for homes, schools, businesses, and transportation

The plan includes nine flood protection projects to safeguard approximately 16,000 parcels, including homes, schools, businesses, agricultural lands and public facilities. Vital transportation networks (220 miles of streets and highways in all) will also be protected by these projects.

2. Clean, safe water in our creeks and bays

Improve water quality in Santa Clara County creeks and bays. Natural stream corridor features are vital to Santa Clara County's quality of life, and are key components of the District's watershed management approach.

3. Healthy creek and bay ecosystems

The health of a creek reflects conditions throughout the watershed, not just those along its banks. The District's environmental work protects and restores habitats and encourages the return of endangered species, such as the California red-legged frog, steelhead trout, and salt marsh harvest mouse.

4. Trails, parks, and open space along waterways

Watersheds, stream corridors, and flood protection levees offer hundreds of acres of land for the entire community to use and enjoy. The District partners with cities and the county to provide open space and recreational opportunities.

1.2.2 Proposed Project

The Sunnyvale Channels were constructed in response to flooding caused by a combination of major storm events with land subsidence and inadequate drainage outlets to South San Francisco Bay. Since construction, sections of the 9.5-mile length of channels have experienced flooding during major storm events. In those sections, flooding has the potential to result in millions of dollars in damages to homes, businesses, and schools. In addition, disruption to businesses and transportation networks can result in significant loss of productivity and revenue. The goal of the Proposed Project is to provide protection to property, avoid transportation shutdowns, and prevent potential riverine flood damages due to the overtopping of the channel banks resulting from a precipitation event.

The Proposed Project consists of developing new flood protection infrastructure necessary to provide 100-year riverine flood protection, developing water quality improvements where possible, and making recommendations for recreational improvements. Two separate projects were initially conceived under the CSC Plan for the Sunnyvale Channels, one for the East Channel and the other for the West Channel. However, these two projects were combined into a single project (the Proposed Project) during the planning phase. The Proposed Project considers development of flood protection, water quality, and recommendations for recreational improvements for both Sunnyvale Channels throughout the design and construction phases. The District intends to complete construction on both Sunnyvale Channels by December 31, 2015, 1 year earlier than the target schedule objectives of the CSC Plan (December 31, 2016).

Notably, the Federal Emergency Management Agency (FEMA) has designated several areas of the City of Sunnyvale within 100-year-flood hazard zones (1% likelihood of being flooded in any year) of the Sunnyvale Channels. The flood hazard designation results in elevated flood insurance rates for residents within these designated areas. Upon completion of the Project, it would be possible to revise FEMA flood hazard maps by eliminating the designation of flood hazards for areas where the Project provides 100-year riverine flood protection. Existing flood insurance rates would then be reduced for residents in areas where the flood hazard designation is eliminated.

1.3 Overview of CEQA Requirements

CEQA is the cornerstone of environmental law and policy in California. CEQA's primary objectives (State CEQA Guidelines Section 15002) are to:

- ensure that the significant environmental effects of proposed activities are disclosed to decision makers and the public;
- identify ways to avoid or reduce environmental damage; prevent environmental damage by requiring implementation of feasible alternatives; and avoid, minimize, reduce and/or compensate for environmental impacts through implementation of mitigation measures;
- disclose the reasons for agency approval of projects with significant environmental effects;
- foster multidisciplinary interagency coordination in the review of projects; and
- allow for public participation in the planning process.

With certain strictly limited exceptions, CEQA requires all state and local government agencies to consider the environmental consequences of projects over which they have discretionary authority before taking action on those projects. It establishes both procedural and substantive requirements that agencies must satisfy to meet CEQA's objectives. For example, the agency with decision-making authority (the lead agency)

must first assess whether a proposed project would result in significant environmental impacts. If the project could result in significant environmental impacts, CEQA requires that the agency prepare an EIR, analyzing both the proposed project and a range of feasible alternatives.

As described in Section 15121(a) of the State CEQA Guidelines, an EIR is a public information document that assesses potential environmental effects of a proposed project, as well as identifies mitigation measures and alternatives to the project that could reduce or avoid adverse environmental impacts (14 CCR 15121[a]). Other key procedural requirements include developing a plan for mitigation measure reporting and monitoring, and carrying out specific noticing and distribution steps to facilitate public involvement in the environmental review process.

The EIR is an informational document used in the planning and decision-making process. It is not the purpose of an EIR to recommend either approval or denial of a project.

1.4 Scope and Intent of this Document

This EIR has been prepared in accordance with CEQA, under which the District's planning and design of flood protection infrastructure and water quality improvements and recommendations for recreational improvements constitutes a "project." The District will use the analyses presented in this EIR, and the public response to them, to evaluate the Proposed Project's environmental impacts and to further modify, approve, or deny approval of the Proposed Project based on the analyses provided herein.

The intent of this EIR is to evaluate in detail all of the components proposed for development under the Proposed Project. The analysis in the EIR has been prepared at a project level pursuant to State CEQA Guidelines Section 15161. Accordingly, this EIR focuses on the changes in the environment that could result during all phases of the project, including planning, construction, and operation such that the EIR adequately satisfies all CEQA requirements to support project implementation without the need for further CEQA documentation.

1.5 Public Involvement Process

As described above, public disclosure and dialogue are priorities under CEQA. Accordingly, CEQA mandates two periods during the EIR process when public and agency comments on the environmental analysis of a proposed project are solicited: during the scoping comment period and during the review period for the Draft EIR. CEQA and the state's CEQA implementation guidelines also encourage lead agencies to

hold public meetings or hearings to review both the draft and final versions of an EIR. Brief descriptions of these milestones are provided below, as they apply to this EIR.

1.5.1 Scoping Comment Period

Scoping refers to the public outreach process used under CEQA to determine the coverage and content of an EIR. The scoping comment period offers an important opportunity for public review and comment in the early phases of a project. The scoping process for an EIR is initiated by publication of the notice of preparation (NOP) required by CEQA, which provides formal notice to the public and to interested agencies and organizations that a DEIR is in preparation. The purpose of the NOP is to inform responsible agencies and the public that the project could have significant effects on the environment and to provide notification of the project's scoping period. During the scoping period, agencies and the public are invited to comment on the project, the approach to environmental analysis, and any issues of concern.

In accordance with State CEQA Guidelines (14 CCR 15082[a], 15103, 15375), the District circulated an NOP of an EIR for the Proposed Project on January 15, 2013 (provided as **Appendix A**). The NOP, in which the District was identified as lead agency for the Proposed Project, was circulated to the public; to the California Office of Planning and Research; to responsible, trustee, and other relevant local, state, and federal agencies; and to other interested parties of the public. In addition, though not specifically required by CEQA, the District held an informational public scoping meeting on January 24, 2013, at Fairwood Elementary School in the City of Sunnyvale. To solicit attendance, the District published ads in the local newspaper and mailed notices to those who received the NOP and interested parties who signed up for the receipt of Project-related information at previous public meetings conducted during the Project's planning phase.

The District also prepared an Initial Study Checklist (IS) for the Proposed Project and circulated the IS for public review along with the Notice of Preparation (also included as part of **Appendix A**). The IS evaluated potential environmental impacts associated with the Proposed Project based on preliminary Project information. The District determined in the IS that several potential environmental impacts associated with the Proposed Project did not have the potential to be significant – those impacts were found to be “less than significant” or to have “no impact” – and could be dismissed from further evaluation in this EIR (see Chapter 3.0, “Environmental Setting and Impact Analysis”). Accordingly, these impacts have only been considered in this EIR if new Project information changed the conclusions compared with the IS analysis of the previously dismissed topic.

Comments received in response to the NOP/IS and scoping meeting are included in this EIR as **Appendix B**. Concerns raised during the scoping period were considered during preparation of this Draft EIR.

1.5.2 Draft EIR Comment Period

Once a DEIR is complete, the lead agency issues a notice of availability in order to provide agencies and the public formal notification that the DEIR is available for review and comment. The notice must be sent to all responsible and trustee agencies, any person or organization requesting a copy, and the county clerk's office for posting. The notice must also be published in a general-circulation newspaper, posted on and off the project site, or directly mailed to residents of properties adjacent to the project site. CEQA then requires a minimum 30- to 45-day public review period, during which the lead agency receives and collates public and agency comments on the project and the document.

The District is now circulating this DEIR for a 45-day public review and comment period and will host a public hearing during this period. The purpose of public circulation and the public hearings are to provide agencies and interested individuals with opportunities to comment on the contents of the DEIR.

For those interested, written comments or questions concerning this DEIR should be submitted within this review period and directed to the name and address listed below. Please submit your response at the earliest possible date, but no later than 45 days from release of the DEIR.

Tiffany Hernandez
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118
(408) 265-2607 ext. 3094
thernandez@valleywater.org

All documents mentioned herein or related to this project can be reviewed on any District business day between the hours of 7:30 a.m. and 5:00 p.m., Monday through Thursday, at the District's headquarters building, located at 5750 Almaden Expressway, San Jose, CA 95118. Please contact Ms. Tiffany Hernandez at (408) 630-3094 to request the documents you wish to review and to arrange a date and a time for said review. In addition, the District has developed a Web page dedicated to the Proposed Project where individuals can access Project documents and keep informed of the overall progress and upcoming scheduled events:

<http://www.valleywater.org/service/SunnyvaleEastandWest.aspx>.

Written comments received in response to the DEIR will be addressed in a Response to Comments document (the Final EIR), which, together with the DEIR, will constitute the entire EIR.

1.5.3 Preparation of Final EIR and Public Hearing

CEQA requires the lead agency to prepare a Final EIR, addressing all substantive comments received on the DEIR before approving a project. The Final EIR must include a list of all individuals, organizations, and agencies that provided comments on the DEIR, and must contain copies of all comments received during the public review period along with the lead agency's responses.

After review of the Final EIR, District staff will recommend to the District's Board of Directors whether to approve or deny the Proposed Project. This governing body then will review the Final EIR, consider District staff's recommendations and public testimony, and decide whether to certify the Final EIR and approve or deny the Proposed Project.

If significant impacts are identified in the EIR and cannot be mitigated, a statement of overriding considerations must be included in the record of the Proposed Project approval and mentioned in the Notice of Determination, to be filed with the State Office of Planning and Research and at the office of the County Clerk (14 CCR 15093[c]).

1.6 Organization of this EIR

This DEIR contains the following components:

Executive Summary. A summary of the Proposed Project, a description of the issues of concern, Project alternatives, and a summary of environmental impacts are provided in this chapter.

Chapter 1, *Introduction.* This chapter describes the purpose and organization of the EIR and its preparation, review, and certification process.

Chapter 2, *Project Description.* This chapter summarizes the Proposed Project, including a description of the Project purpose and goals; a brief description of the Project Area and locations of existing and proposed facilities; the Project approach and activities, including construction; Project implementation and oversight; best management practices implemented for the Proposed Project; and related permits and approvals.

Chapter 3, *Environmental Setting and Impact Analysis.* Chapter 3 includes 13 subchapters that describe existing environmental conditions and the Proposed Project's anticipated environmental impacts. The introduction to Chapter 3 discusses potential Project impacts that were dismissed from further analysis in the IS. The following resource topics are addressed in Chapter 3:

- 3.1 Aesthetics
- 3.2 Air Quality
- 3.3 Biological Resources

- 3.4 Cultural Resources
- 3.5 Geology and Soils
- 3.6 Greenhouse Gas Emissions
- 3.7 Hazards and Hazardous Materials
- 3.8 Hydrology, Geomorphology & Water Quality
- 3.9 Land Use and Planning
- 3.10 Noise and Vibration
- 3.11 Recreation
- 3.12 Transportation and Traffic
- 3.13 Utilities and Service Systems

The above resource sections also identify mitigation measures to address (where feasible) all impacts evaluated as significant.

Chapter 4, *Other Statutory Considerations*. Addressing the Proposed Project's potential to contribute to cumulative impacts in the Project's region, Chapter 4 outlines the Project's potential to induce growth and identifies significant, irreversible environmental changes resulting from the Project.

Chapter 5, *Alternatives Analysis*. This chapter describes the process through which alternatives to the Proposed Project were developed and screened, evaluates their likely environmental impacts, and identifies the environmentally superior alternative.

Chapter 6, *Report Preparation*. This is a list of the individuals involved in preparing the EIR and their responsibilities.

- Appendix A Notice of Preparation/Initial Study and Public Comments – January 2013
- Appendix B Sunnyvale East and West Channels Flood Protection Project - Planning Study Report
- Appendix C Stream Maintenance Program Update 2012-2022 Subsequent Environmental Impact Report Executive Summary and Summary of Past and Anticipated Stream Maintenance Activities at the Sunnyvale Channels
- Appendix D Mitigation Monitoring and Reporting Program
- Appendix E Sunnyvale East and West Channel Flood Protection Project Cultural Resources Technical Report
- Appendix F Candidate Key Observation Point Locations
- Appendix G Air Quality and Greenhouse Gas Emissions Calculations
- Appendix H Project Geotechnical Studies

- Appendix I 2007 Hazardous Materials Report
- Appendix J Construction Noise Calculations
- Appendix K-1 Traffic Construction Trip Calculations
- Appendix K-2 Traffic LOS Analysis for Caribbean Bridge Replacement
- Appendix L Special-Status Plant Species Considered But Rejected for Occurrence in the Project Area
- Appendix M Detailed Descriptions of Special-Status and Locally Significant Plant Species Potentially Occurring in the Project Area
- Appendix N Detailed Descriptions of Special-Status Wildlife Species Potentially Occurring in the Project Area
- Appendix O Preliminary Delineation of Wetlands and Other Waters
- Appendix P Chapter 3.3 Biological Resources Figures: Soil and Habitat Impacts Maps

1.7 Impact Terminology

This DEIR uses the following terminology to describe environmental effects of the Proposed Project.

- A finding of no impact is made when the analysis concludes that the Project would not affect the particular environmental resource or issue.
- An impact is considered less than significant if the analysis concludes that there would be no substantial adverse change in the environment and that no mitigation is needed.
- An impact is considered less than significant with mitigation if the analysis concludes that there would be no substantial adverse change in the environment with the inclusion of the mitigation measures described.
- An impact is considered significant or potentially significant if the analysis concludes that there could be a substantial adverse effect on the environment.
- An impact is considered significant and unavoidable if the analysis concludes that there could be a substantial adverse effect on the environment and no feasible mitigation measures are available to reduce the impact to a less-than-significant level.
- Mitigation refers to specific measures or activities adopted to avoid or compensate for an impact, or reduce its severity.
- A cumulative impact can result when a change in the environment results from the incremental impact of a project when added to other related past, present, or reasonably foreseeable future projects. Significant cumulative impacts may result from individually minor but collectively significant projects.

Chapter 2

Project Description

2.1 Introduction

The Sunnyvale East and West Channels are engineered water conveyance channels that collect and transport stormwater runoff from urban areas in the cities of Sunnyvale and Cupertino to the southern portion of the San Francisco Bay. The Sunnyvale East and West Channels are primarily open-water channel features, with subsurface culverts at road crossings in several locations.

Unlike many of the flood control channels in Santa Clara County, where engineered systems replaced a historic creek alignment, the Sunnyvale East and West Channels (Sunnyvale Channels) are not located in the vicinity of a historic creek. Between the early 1900s and 1950s, land surface subsidence caused by groundwater extraction from artesian wells and groundwater pumping altered the area's drainage. Consequently, runoff from portions of the watershed that would have drained to Stevens Creek or Calabazas Creek became isolated and ponded, and caused flooding.

In response to this flooding, the Santa Clara Valley Water District (District) constructed the Sunnyvale Channels between 1959 and 1976. The channels were designed with a capacity to convey runoff from the 10-year storm event. Since construction of the channels, the Project Area experienced flooding during major storm events in 1963, 1968, 1983, 1986, and 1998.

Current Federal Emergency Management Agency (FEMA) mapping shows that the Project Area is susceptible to flooding and overbank flows from the Sunnyvale Channels at several locations during a 100-year storm event.

The District is now proposing the Sunnyvale East and West Channel Flood Protection Project (Proposed Project) to provide additional flood protection benefits to the cities of Sunnyvale and Cupertino and water quality improvements to the Sunnyvale Channels. The Proposed Project has been initiated under the District's Clean, Safe Creeks and Natural Flood Protection (CSC) Program. The CSC Program is discussed in Chapter 1, "Introduction."

10-Year Storm Event is an event with a 10% likelihood of occurring in any given year

100-Year Storm Event is an event with a 1% likelihood of occurring in any given year

2.2 Project Purpose and Objectives

2.2.1 Project Purpose

The purpose of the Proposed Project is to provide 100-year riverine flood protection to approximately 1,618 properties and 47 acres within the City of Sunnyvale and improve water quality.

2.2.2 Project Objectives

To achieve the project purpose, the Proposed Project would involve construction of a series of infrastructure upgrades. The Proposed Project is intended to meet the following objectives:

- Provide riverine flood protection where historic flooding has occurred and future flooding is possible from a 100-year storm event (1% risk of occurring any year);
- Provide a basis to update FEMA flood hazard maps upon completion of the Proposed Project to reflect 100-year flood protection along the improved channels and reduce or eliminate flood insurance requirements in the communities surrounding the Sunnyvale Channels;
- Provide infrastructure improvements beyond 100-year flood protection as necessary to meet the District's freeboard standards;
- Provide water quality improvements by repairing/stabilizing existing erosion sites; and
- Provide recommendations for recreational enhancements in coordination with flood and water quality improvements.

The District intends to complete construction on both Sunnyvale Channels by December 31, 2015, 1 year earlier than the target schedule objectives of the CSC Program.

The Proposed Project is intended to provide only riverine flood protection. The downstream/northern portions of the Project Area are also susceptible to tidal flooding. Tidal flooding of the Project Area is being addressed by the District through participation in the U.S. Army Corps of Engineers' (USACE's) Shoreline Protection Study^A.

Riverine flooding occurs from overtopping of the stream channel during a storm event.

Tidal flooding occurs from tidal inundation of the shoreline.

^A More information on the Shoreline Protection Study is available from: <http://www.southbayshoreline.org>.

Following implementation of the Project, it is estimated that 100-year riverine flood protection would be provided to 1,618 properties adjacent to the Sunnyvale East Channel (East Channel) and to 47 acres adjacent to the Sunnyvale West Channel (West Channel).

2.3 Project Location

The Sunnyvale Channels flow northward through the City of Sunnyvale (**Figure 2-1**). The far southern portion of the East Channel is contained in an underground pipe and located in the northern area of the City of Cupertino. At the northern end of the Project Area, toward San Francisco Bay, the channels discharge to the Guadalupe Slough adjacent to Pond A4. In the northern (downstream) reaches of the channels near San Francisco Bay, the channels receive tidal backwatering via the Guadalupe Slough and can also receive excess flows from nearby Calabazas and San Tomas Aquino Creeks.

The Sunnyvale Channels primarily traverse and collect stormwater runoff from developed and urban areas. The channels are generally trapezoidal, with earthen embankments. Several reaches have hardened concrete or rock sloped banks, and many sections are subsurface concrete box culverts, primarily at road crossings. The channels are generally bounded by 10- to 20-feet of right-of-way that runs parallel along both banks of the channels. Such right-of-way typically contains District maintenance roads and/or undeveloped areas, and buffer the channels from adjacent land uses. The Sunnyvale Channels cross major arterial roadways, including U.S. Highway (Hwy) 101, State Route (SR) 237, Caribbean Drive, Central Expressway, and El Camino Real, as well as numerous smaller, local roadways (Figure 2-1). In the northern Project Area, development density is less intense, consisting of baylands that fringe San Francisco Bay. This area is characterized by open spaces in the vicinity of Guadalupe Slough and Pond A4, with higher natural resource value. **Figure 2-2** presents several photographs of the Sunnyvale Channels.

Terminology used in this EIR to describe and define the project location includes the following:

- **Sunnyvale Channels.** This term refers to the entirety of the Sunnyvale East and West Channels, as mapped on Figure 2-1, and areas between the top of their existing channel banks.
- **Project Site.** The Project Site includes the Sunnyvale Channels from their upstream extents, downstream to their confluence with Guadalupe Slough near Pond A4, and areas outside of the channel banks and within channel easements where project components are proposed. The East or West Channel Project Sites may also be specifically referred to in this context.

- **Project Area.** The Project Area includes the Project Site and immediate surrounding areas that could be affected by activities at the Project Site or otherwise influenced by the Project Site. The Project Area includes adjacent development and land uses that could be flooded, have views of the site, or can hear noise emitted from the site, among other surrounding areas.
- **Project Work Area.** The Project Work Area consists of the areas of the Project Site where construction would generally occur. This includes the Sunnyvale Channels; channel easements and the District's existing right-of-way; and proposed property acquisitions, including for temporary construction staging areas (refer to Section 2.5.1).

2.3.1 Sunnyvale East Channel

The Sunnyvale East Channel extends approximately 6.5 miles upstream from the Bay and drains a watershed area of approximately 7.25 square miles (sq. mi.) (Figure 2-1). Land uses in the East Channel watershed are primarily medium density residential, with some industrial areas. The East Channel is tidally influenced from Guadalupe Slough to approximately the SR 237 crossing.

2.3.2 Sunnyvale West Channel

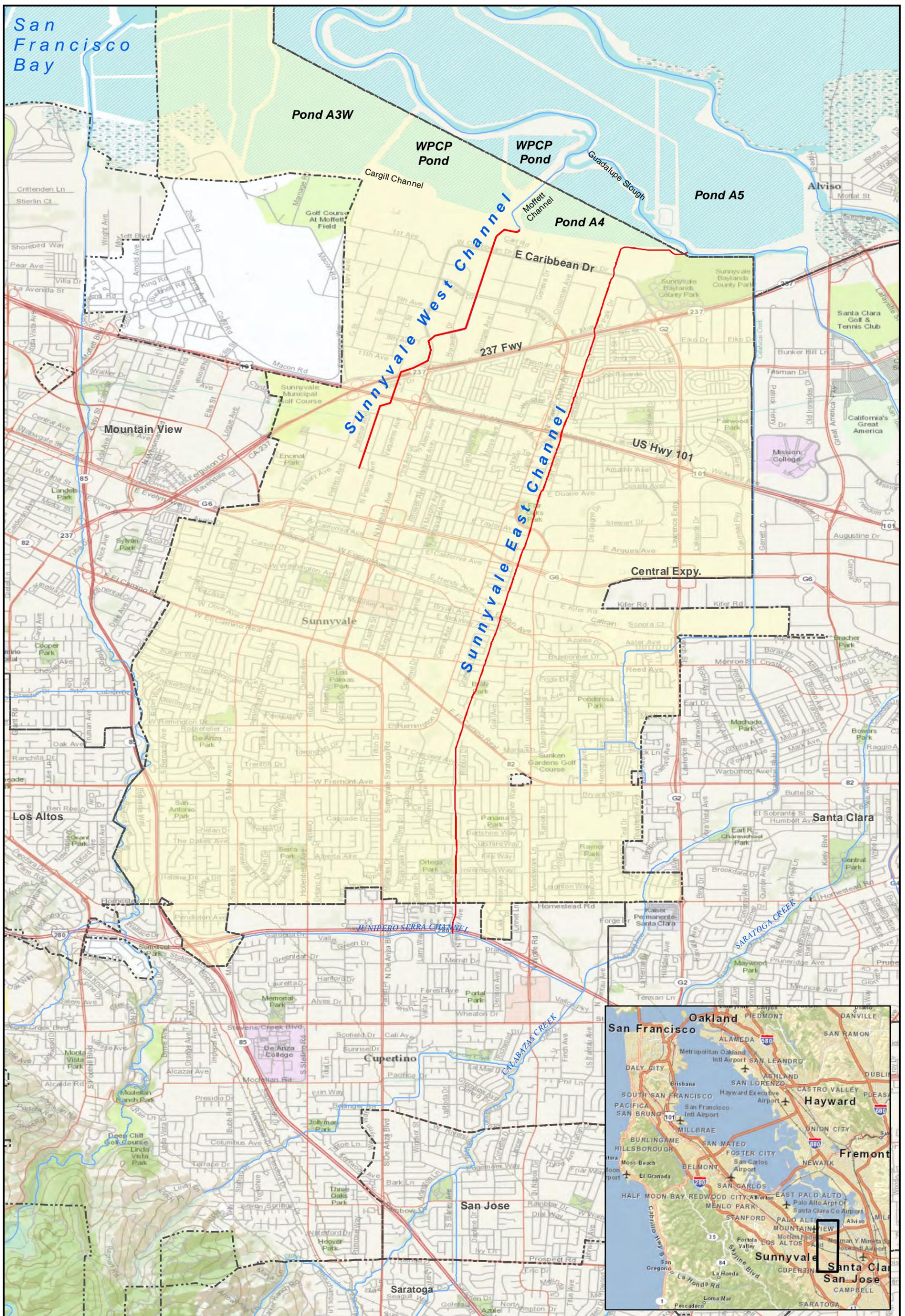
The Sunnyvale West Channel extends approximately 3 miles from the Bay and drains a watershed area of approximately 7.6 sq. mi (Figure 2-1). Runoff from more than half of the West Channel watershed area (4.8 sq. mi.) is pumped into the West Channel near the southwest corner of Pond A4. Industrial land uses surround the northern (downstream) half of the West Channel, and medium density residential land uses surround the southern (upstream) half of the channel. The West Channel is tidally influenced from Guadalupe Slough to Mathilda Avenue. The West Channel transitions to become the Moffett Channel near the City of Sunnyvale Water Pollution Control Plant (WPCP), just north of Carl Road (Figure 2-1).

The Moffett Channel is approximately 4,300 feet long, 125 feet wide, and 2 to 15 feet deep (water depth varies throughout the day according to tidal influence). The Moffett Channel covers an area of roughly 12.4 acres and functions as a conveyance channel for stormwater delivered from the West Channel and received from the Lockheed Channel to the west, to be conveyed toward the South Bay. The Lockheed Channel is not directly connected to either the Sunnyvale West Channel or Moffett Channel. However, discharges from the Lockheed Channel are pumped to the Sunnyvale West Channel. The watershed that contributes to the Lockheed Channel is accounted for within the total 4.8 sq. mi. watershed area of the Sunnyvale West Channel.

2.3.3 Guadalupe Slough and Pond A4

The Sunnyvale East and Moffett Channels flank around the periphery of Pond A4 before flowing into Guadalupe Slough (Figure 2-1). Pond A4 is an open water salt pond surrounded by an extensive network of sloughs, salt ponds, and channels. Water from the Cargill Channel (immediately to the west) is siphoned over to Pond A4. Therefore, Pond A4 does not directly receive surface water from the bay, Guadalupe Slough, Sunnyvale East or Sunnyvale West via Moffett Channel. However, Pond A4 is likely hydrologically connected by groundwater to its surrounding water bodies. The water in Pond A4 is regularly managed by the District to prevent water quality problems (i.e. high salinity) by pumping water to Pond A5, which draws cleaner water from Cargill channel into the pond (via the siphon) promoting pond circulation.

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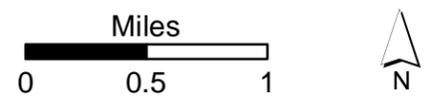


- Project Channels
- Creeks
- Sunnyvale City Limits

Note: WPCP = Sunnyvale Water Pollution Control Plant

Source: SCVWD 2012; Bing Maps

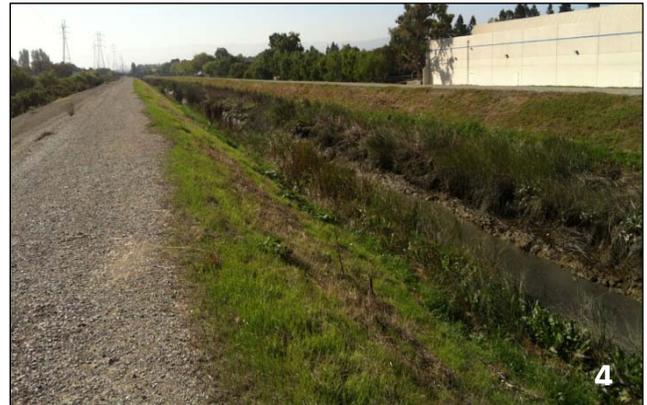
**Figure 2-1
Sunnyvale East and West Channels
Flood Protection Project Site**



Prepared for Santa Clara Valley Water District

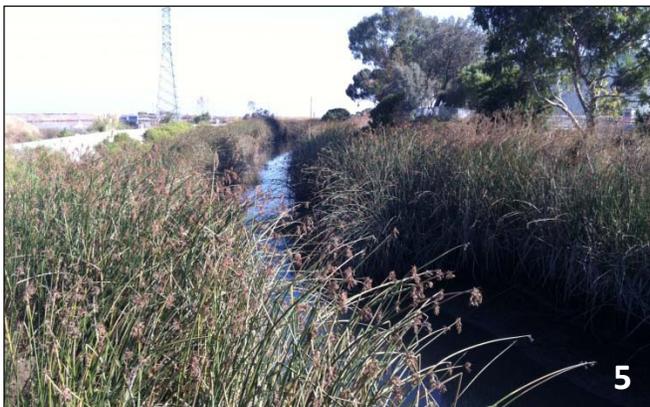
October 2013

Sunnyvale East Channel



1) Looking east near Pond A4; 2) Existing bank erosion, looking north from Blythe Avenue; 3) Existing Caribbean Drive bridge; 4) Looking south from Caribbean Drive

Sunnyvale West Channel



5) Looking north from Carl Road; 6) Looking from north (left) to south (right) at the Caribbean Drive bridge

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2.4 Project Planning and Development

The District initially developed several conceptual Project alternatives to fulfill the four identified outcomes of the District's CSC Program (identified in Section 2.2.1) and the Project's specific objectives (identified in Section 2.2.2). The conceptual Project alternatives included a combination of infrastructure upgrades to improve flood protection and repair existing in-channel erosion sites. Conceptual alternatives were evaluated and refined based on the District's Natural Flood Protection (NFP) evaluation process and a risk assessment. From the evaluation process, a recommended alternative was identified and selected. This alternative has been further refined throughout the planning and design process to avoid or reduce potential environmental effects and address public stakeholder input.

2.4.1 Alternatives Development

Flood Protection Improvements

Before identifying specific flood protection improvements, the District evaluated historic and potential future riverine flooding of the Sunnyvale Channels. Historic flooding in the Project area occurred before construction of both Sunnyvale Channels in 1955 and before completion of East Channel in 1967. Flooding also occurred after the construction of both Sunnyvale Channels in 1983, 1986, 1998, and 2012.

Potential future flooding of the Project Area was assessed using current FEMA flood hazard zone maps of the Project Area and hydrologic modeling of the flood flow distribution and water surface elevations in the Sunnyvale Channels. The flood flow distribution was calculated at several roadway crossings along both Sunnyvale Channels during the 10- and 100-year storm events. The water surface elevation is used to identify locations of channel overtopping and freeboard deficiency. Additional information of the historic and potential future flooding of the Project Area is presented in Chapter 3.6, "Hydrology, Geomorphology and Water Quality."

Flood flow distribution is the quantity of streamflow discharged at different locations along the channels during a flood event.

Surface water elevation is the elevation of surface water in the channels during a flood event.

Freeboard is the additional vertical height required for infrastructure to be built above a predicted flood elevation to provide capacity for additional but unexpected flood elevations.

Freeboard deficiency is the additional vertical height necessary along a channel reach to meet a specific freeboard standard or the required vertical height.

Using information of historic and potential future flooding, the District identified that flooding of the Sunnyvale Channels during a 100-year storm event results from the following:

- Insufficient channel capacity. Currently the channels have the capacity to convey flows from approximately a 10-year storm event. As such, flooding of the channels is likely during larger magnitude storm events.
- Backwater flows from Calabazas and San Tomas Aquino Creeks during a 100-year storm event. The Calabazas and San Tomas Aquino Creeks discharge flows into the Guadalupe Slough along with the Sunnyvale Channels.

Consequently, during large storm events, flood flows from the Calabazas and San Tomas Aquino Creeks backflow up and into the Sunnyvale Channels, adding to elevated levels of stormwater runoff already in the channels during storm events.

FEMA versus District Freeboard Standards

FEMA Freeboard Standard: When the water surface elevation is below the adjacent natural ground elevation, no freeboard is required. When the water surface elevation is above the adjacent natural ground elevation, 3 feet of freeboard is required with an additional 1 foot of freeboard required 100 feet on either side of structures that are within the leveed section of a creek or where the flow is constricted such as at bridges. FEMA also requires an additional 1/2 foot above the minimum at the upstream end of the levee, tapering to not less than the minimum at the downstream end of the levee. (See note below)

District Freeboard Standard: When the water surface elevation is below the adjacent natural ground elevation, 1 foot of freeboard is required. When the water surface elevation is above the adjacent natural ground elevation, 3.5 feet of freeboard is required with an additional 1/2 foot of freeboard required within 100 feet of bridges or other constrictions.

Note: Since it is not clear how to interpret FEMA’s additional 1/2 foot at the upstream and tapering to not less than the minimum at the downstream, the District uses 3.5 feet as the minimum freeboard.

- Tidal influence. The northern portions of the Sunnyvale Channels regularly receive tidal currents. High tides provide the greatest amount of additional water in the channels and during flood events add flow to stormwater runoff and backwater flows from the Calabazas and San Tomas Aquino Creeks.
- Potential future sea level rise. Sea levels in San Francisco Bay are rising and the rate of rise is expected to accelerate in the future. Rising sea levels are predicted to increase the tidal flows in the channels.

The District next developed conceptual flood protection components to address: 1) specific locations of the Sunnyvale Channels susceptible to riverine flooding from a 100-year storm event, and 2) areas of freeboard deficiency. FEMA and District freeboard standards were used (see callout box and refer to Chapter 3.6, “Hydrology, Geomorphology and Water Quality”). Conceptual flood protection components consisted of the following: floodwalls, levees, replacement or modification of existing bridges/culverts, development of off-channel detention basins, and use of Pond A4 as a detention basin. Feasible Project alternatives were then developed from either individual or a combination of conceptual Project components, with the goal of conveying the Sunnyvale Channel’s 100-year riverine flow downstream to Guadalupe Slough and the southern portion of San Francisco Bay.

Erosion Repairs

During the development of conceptual Project alternatives, the District identified the location (length and dimensions) and general causes of erosion problems along the Sunnyvale Channels. Erosion sites were initially identified using past field inspection reports and a geotechnical study of the Sunnyvale Channels (SCVWD 2008a, 2008b). Throughout the Project planning and design phases, additional erosion sites were identified from additional site investigations. Chapter 3.6, "Hydrology, Geomorphology and Water Quality," presents additional information describing the causes and repair approaches for the erosion sites. Primary causes of erosion in the Sunnyvale Channels include the following:

- Lack of an upstream sediment supply. The upstream/southern portions of the Sunnyvale Channels supply little sediment to the downstream reaches, resulting in historic invert/bed erosion in the upstream reaches of both channels.
- Insufficient channel right-of-way. The right-of-way running along both channels are confined by urban development and provide only a narrow corridor. This area adjacent to the channel contains the District's channel maintenance roads and only right-of-way available for the channels. The narrow right-of-way typically constrains the District's ability to address eroding banks through grading the bank back to a gentler slope.
- Steep earthen banks. Due to the narrow right-of-way corridors, large reaches of earthen bank construction, and steep 1.5:1 (horizontal:vertical) side slopes which are inherently unstable; many of these reaches are experiencing severe bank erosion. Because bank stabilization treatments along the Sunnyvale Channels can't use a wider and more gently sloped bank approach, treatments are used for steeper bank and these typically require rock protection.
- Intermittent hardscape and natural channel. This alternating hardscape pattern exists primarily because of the narrow right-of-way corridor along the channels. The District has historically repaired bank erosion by installing sacked concrete, rip-rap, or concrete along the channel banks. As a result, sections of natural channel immediately downstream of existing hardscape features are particularly at risk for further erosion problems.
- Multiple road crossings. The Sunnyvale Channels contain numerous bridge/culvert roadway crossings, many of which are hydraulically steep (i.e., capable of inducing supercritical flow) and contain drop structures capable of downstream scour and deposition.
- Hydromodification of the watershed. The Sunnyvale Channels watershed has been modified from high-density urbanization and land development. Urbanization and land development increase runoff volume, decrease the

watershed's time of concentration to deliver runoff to the channels, increase the peak flow rates, and increase streamflow velocities.

The engineering methods for erosion protection were developed based on site-specific conditions to identify the most suitable treatment approaches.

2.4.2 Project Development Process

Natural Flood Protection (NFP) Evaluation Process

The District's Board of Directors (Board) established NFP Ends Policy No. 3 in 2004 and revised the policy in 2012 (SCVWD 2012a). The NFP goals are to provide natural flood protection for residents, businesses, and visitors while reducing the potential for flood damages. NFP objectives to meet these goals are as follows:

- Remove parcels from flooding, applying an integrated watershed management approach that balances environmental quality and protection from flooding;
- Preserve flood conveyance capacity and structural integrity of stream banks, while minimizing impacts on the environment and protecting habitat values;
- Promote the preservation of floodplain functions;
- Reduce flood risks through public engagement; and
- Prepare and respond effectively to flood emergencies countywide to protect life and property. (SCVWD 2012a)

In developing the Proposed Project, the District conducted an NFP evaluation process to compare Proposed Project flood protection alternatives with the objectives and goals identified in Board's Ends Policy No. 3. The NFP evaluation involved parcel owners along the Sunnyvale Channels and the general public. The District coordinated with adjacent parcel owners, the general public (public input is discussed further below), and District experts to establish relative weights (high, medium, or low, shown after each objective listed below) on subjects related to the NFP objectives and Project objectives (e.g., life-cycle costs).

1. Homes, schools, businesses, and transportation networks are protected from flooding and erosion (low);
2. Ecological functions and processes are supported (medium);
3. Physical stream functions and processes are integrated (low);
4. Maintenance requirements are minimized (high);

5. Projects are integrated within the watershed as a whole (low);
6. The quality and availability of water is protected (high);
7. Cooperation with local agencies achieves mutually beneficial goals (high);
8. Community benefits are provided beyond flood protection (medium); and
9. Life-cycle costs are minimized (medium).

Various criteria were next developed to rate (on a scale of 0–5) each Project alternative’s ability to meet each objective. Based on the alternative’s score and weight of the objectives, several conceptual alternatives were eliminated. However, a single, best alternative was not identified. For additional information on the Project’s NFP evaluation process, refer to **Appendix B**.

Further Evaluation of the Proposed Project

Following the project development process as described above, the top three scoring project alternatives were then assessed for risks associated with: 1) using Pond A4 as a detention basin, 2) using Braly Park (adjacent to the East Channel north of SR 82) as a detention basin, and 3) the need for right-of-way acquisition. The risk assessment considered environmental factors associated with use of detention basins (e.g., water quality), school district support for the Braly Park detention basin alternative, and the District’s ability to purchase right-of-way properties.

Based on the risk assessment, District staff initially recommended an alternative that combined floodwalls, levees, and use of Pond A4 as a detention basin, and provided erosion repairs. This initial alternative that used Pond A4 was recommended by staff because it provided the most comprehensive flood protection and was cost effective. As initially considered, routing both Sunnyvale Channels to Pond A4 would remove both channels from tidal influence and the backwatering effects from other nearby channels. If the Project used Pond A4, the Sunnyvale Channels would also not be susceptible to future effects from sea level rise. Flow between Pond A4 and Guadalupe slough would continue to be regulated through the use of a slide gate and tide gates.

Project Refinement to Avoid Environmental Impacts

However, for several reasons, including the District’s objective to avoid and minimize potential environmental impacts, the preliminary alternative that used Pond A4 was rejected. During the Project refinement phase, the District revised the Project further based on the following issues:

- Water Quality: Use of Pond A4 as a detention basin for the Sunnyvale Channels was rejected due to water quality and potential contamination issues (i.e., pesticides and metals) between Pond A4 water and Guadalupe Slough. By not using Pond A4 as a detention basin, the Sunnyvale Channels (under the

Proposed Project) would continue to be influenced by tides and backwatering from Calabazas and San Tomas Aquino Creeks. Additional discussion of potential water quality impacts related to use of Pond A4 as a detention basin is provided in Chapter 5, "Alternatives Analysis."

- Wetlands and Salt Marsh Harvest Mouse Habitat: Levee modifications were proposed along the west boundary of Pond A4 downstream of Carl Road. Development of levees in these areas had the potential to fill and affect wetlands that potentially provide salt marsh harvest mouse habitat. Further analysis resulted in removing the levee along the western boundary of Pond A4. Levees from Pond A4 upstream to Carl Road were changed to floodwalls. The floodwalls require a smaller area of ground-disturbance, and thus are considered by the District to have less potential to affect wetlands and less potential to affect salt marsh harvest mouse habitat in this area.
- Wildlife Corridors: On the West Channel, between Carl Road and Caribbean Drive, Project components were modified to accommodate wildlife movement. Floodwalls and use of rock slope protection, which were originally proposed in this reach, were eliminated in favor of levees which do not restrict wildlife movement within the project area.
- Recreation and Aesthetics: Floodwalls at several locations were moved from the outboard to the inboard side of channel maintenance roads, to accommodate potential future recreational use of channel maintenance roads. In addition, locating floodwalls on the inboard side of maintenance roads preserves existing views, which would have been obstructed by outboard floodwalls.
- Vegetation: Floodwalls at several locations were moved from the outboard to the inboard side of the channel maintenance roads to preserve existing trees located on the outboard side of the channel.

Public Stakeholder Involvement

Throughout the project planning process, the District has involved entities that may have a vested interest in the goals, activities, implementation, and outcomes of the Project. The District recognizes that a successful project stems from collaboration with project stakeholders. Throughout the planning process, outreach activities have been implemented by the District to inform the public of Project progress and to solicit public feedback. Outreach efforts or public meetings were held at milestones during the planning process, including reporting on the following topics (SCVWD 2010):

- **Planning Level Geotechnical Field Work (May 2007)**: A flyer was mailed to approximately 3,000 residents adjacent to the Sunnyvale Channels, notifying them about the geotechnical field work being performed in their area.

- **Historical Flooding Survey (October 2007):** A survey was mailed to approximately 3,000 residents adjacent to the Sunnyvale Channels, requesting information about historical flooding in the area.
- **Conceptual Alternative Meeting (March 2009):** Conceptual alternatives were discussed with the public and the public's feedback was solicited.
- **Natural Flood Protection (May 2009):** A Natural Flood Protection (NFP) evaluation process survey was mailed to approximately 6,000 residents adjacent to the Sunnyvale Channels, asking residents to rank the nine objectives (discussed under the NFP evaluation process section, above) to be used in evaluating the feasible alternatives.
- **Neighborhood Update (June 2009):** A flyer with Project updates and results from the NFP evaluation process survey was mailed out to approximately 6,000 residents adjacent to the Sunnyvale Channels.
- **Feasible Alternative Meeting (November 2009):** The feasible alternatives (including the NFP evaluation process) were discussed with the public and their feedback was solicited.
- **Planning Recap (April 2011):** A flyer presenting the project objectives, the planning phase process, and identifying next steps was distributed to local residents.
- **Design Level Geotechnical Field Work (June 2011):** A flyer was mailed to approximately 3,000 residents adjacent to the Sunnyvale Channels, notifying them about the geotechnical field work being performed in their area.
- **Project Update Flyer (January 2012):** A flyer with Project updates and results of additional environmental studies leading to the selection of a new alternative was distributed to local residents.
- **California Environmental Quality Act (CEQA) Public Scoping Meeting (January 2013):** The Proposed Project and CEQA requirements for the Project were presented and comments from the public on environmental issues of concern related to the Project were collected. Two newspaper advertisements were published in the Sunnyvale Sun before the scoping meeting. Additional information on this meeting is provided in Chapter 1, "Introduction."

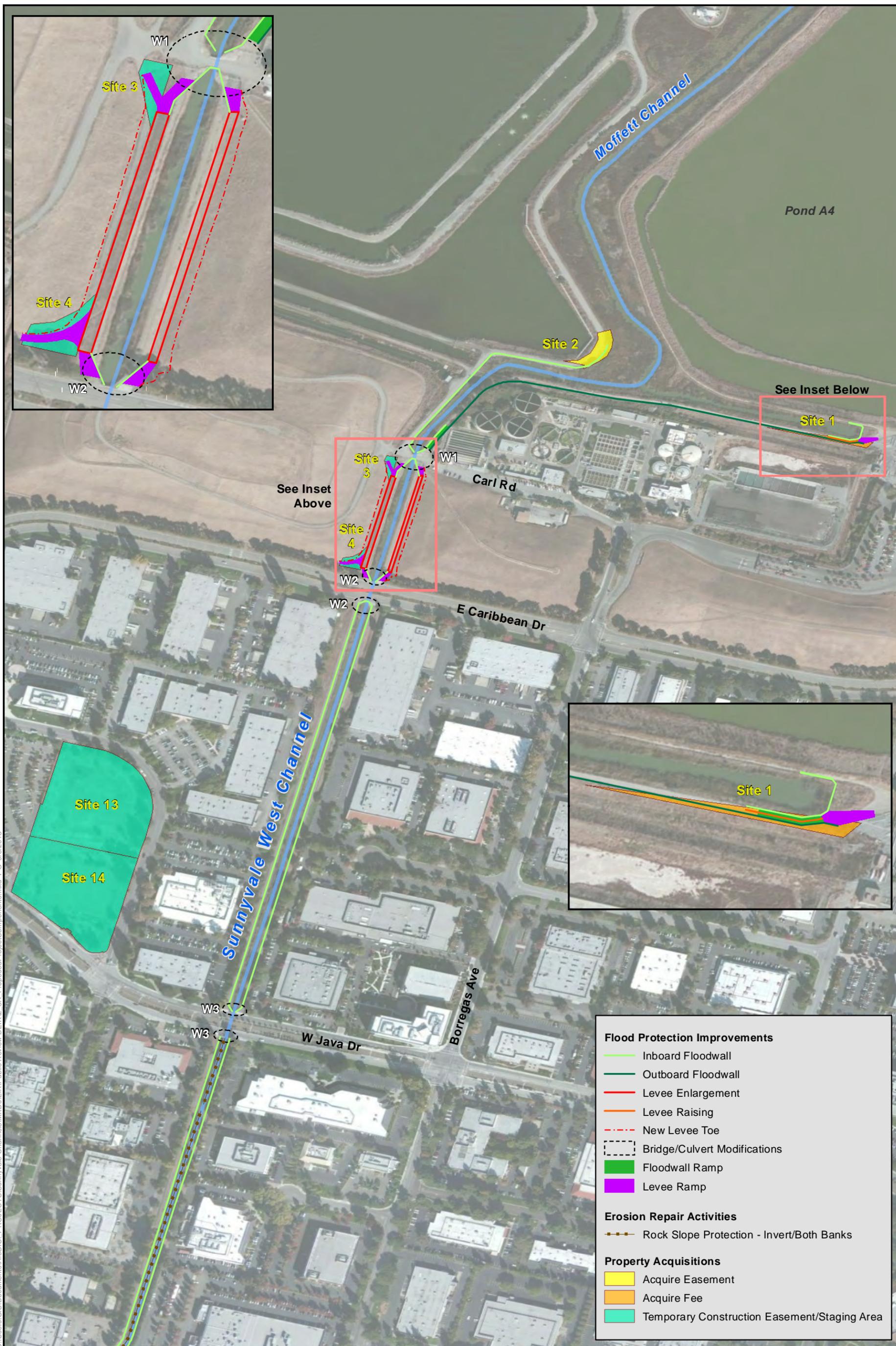
As the planning process has progressed, the District has also reached out to various other municipalities, local entities, and stakeholders that may be affected by the Project. Several meetings were held, including with the Sunnyvale City Council, City of Sunnyvale WPCP staff, City of Sunnyvale Planning Department staff; Lockheed-Martin; National Aeronautics and Space Administration (NASA); Santa Clara Unified School District Board of Education and Braly Elementary School faculty staff; U.S. Fish and

Wildlife Service (USFWS); Sunnyvale Chamber of Commerce; and Sunnyvale Bicycle and Pedestrian Advisory Commission. The following regulatory agencies were contacted—USFWS, USACE, the California Department of Fish and Wildlife, the San Francisco Bay Regional Water Quality Control Board, and the San Francisco Bay Conservation and Development Commission.

2.5 Proposed Project

The Proposed Project consists of a series of flood protection and water quality improvements. The Project design complies with the District's freeboard^B standards. Proposed channel improvements include floodwalls, levee and maintenance road improvements, bridge/culvert modifications, and sediment removal. The Project also includes repairing and stabilizing several streambank sections that are unstable and actively eroding. Repairing these streambanks would provide water quality benefits to the channels. **Figures 2–3a** through **2–3i** illustrate the locations of Proposed Project components. Each Project component is described further in Section 2.5.1, below.

^B Freeboard is the additional vertical height of infrastructure built above a predicted flood elevation to provide capacity for additional but unexpected flood elevations. Freeboard is essentially a safety measure taken to reduce the risk from flood events.



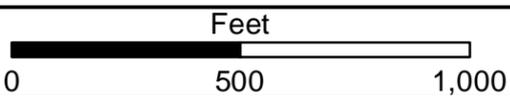
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Sources: SCVWD 2012; Bing Maps

**Figure 2-3a
Proposed Project Components**

Prepared for:
Santa Clara Valley Water District
October 2013



Sunnyvale East and West
Channel Flood Protection Project



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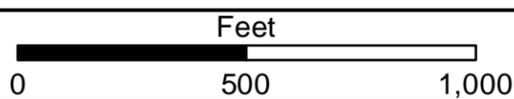
Flood Protection Improvements	
	Inboard Floodwall
	Bridge/Culvert Modifications
Erosion Repair Activities	
	Rock Slope Protection - Toe/Both Banks
Concrete Channel Modifications	
	Wingwall Related Modification
Property Acquisitions	
	Temporary Construction Easement/Staging Area



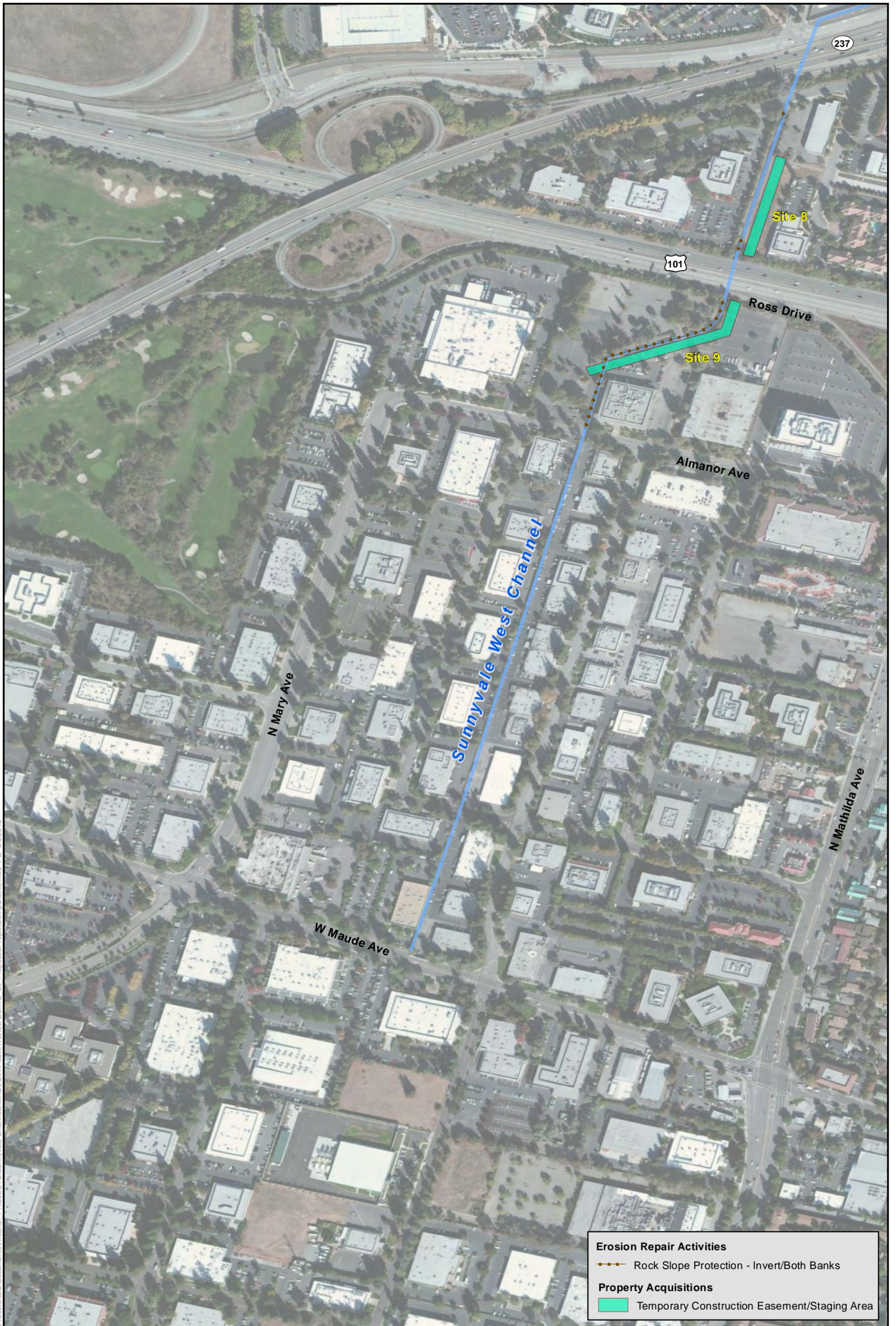
Sources: SCVWD 2012; Bing Maps

**Figure 2-3b
Proposed Project Components**

Prepared for:
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October 2013



Sunnyvale East and West
Channel Flood Protection Project



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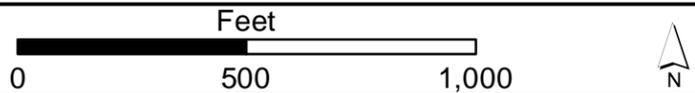
Erosion Repair Activities	
	Rock Slope Protection - Invert/Both Banks
Property Acquisitions	
	Temporary Construction Easement/Staging Area



Sources: SCVWD 2012; Bing Maps

**Figure 2-3c
Proposed Project Components**

Prepared for:
Santa Clara Valley Water District
October 2013



Sunnyvale East and West
Channel Flood Protection Project



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Flood Protection Improvements	
—	Inboard Floodwall
—	Outboard Floodwall
—	Levee Enlargement
—	Levee Raising
	Bridge/Culvert Modifications
■	Floodwall Ramp
■	Levee Ramp
Property Acquisitions	
■	Temporary Construction Easement/Staging Area

Horizon
WATER and ENVIRONMENT

Prepared for:
Santa Clara Valley Water District
October 2013

Sources: SCVWD 2012; Bing Maps

Feet

0 500 1,000

N

Figure 2-3d
Proposed Project Components

*Sunnyvale East and West
Channel Flood Protection Project*



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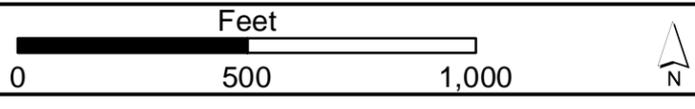
Flood Protection Improvements	
	Inboard Floodwall
	Outboard Floodwall
	Bridge/Culvert Modifications
	Floodwall Ramp
	Levee Ramp
Erosion Repair Activities	
	Outfall Related Modification
	Wingwall Related Modification
	Bench Construction with Rock
	Rock Slope Protection - West Bank
	Rock Slope Protection - Both Banks
	Rock Slope Protection - Bed Only
	Concrete Lined Channel
Property Acquisitions	
	Acquire Easement
	Acquire Fee



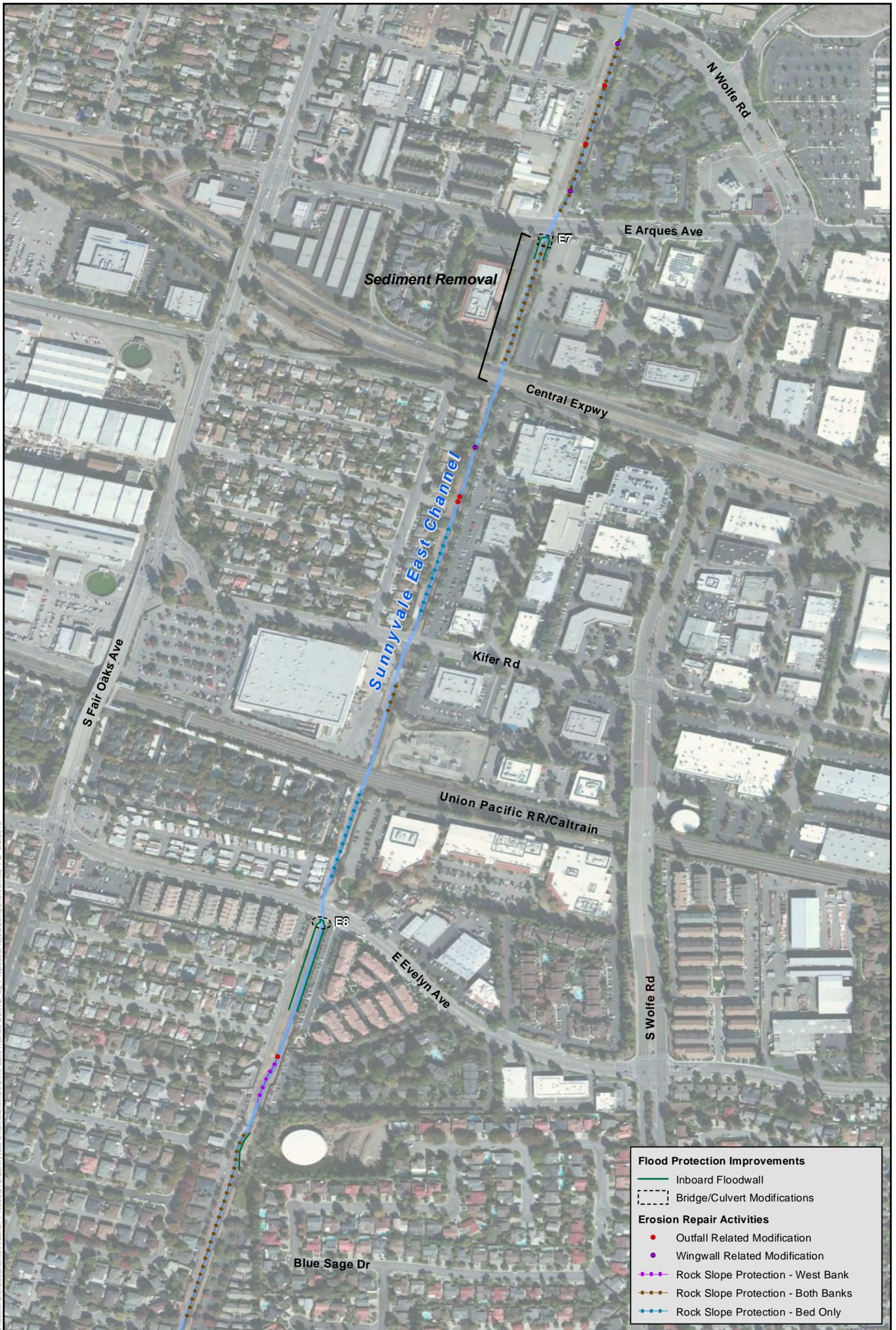
Sources: SCVWD 2012; Bing Maps

Figure 2-3f
Proposed Project Components

Prepared for:
Santa Clara Valley Water District
October 2013



Sunnyvale East and West Channel Flood Protection Project



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- | Flood Protection Improvements | |
|-------------------------------|------------------------------------|
| | Inboard Floodwall |
| | Bridge/Culvert Modifications |
| Erosion Repair Activities | |
| | Outfall Related Modification |
| | Wingwall Related Modification |
| | Rock Slope Protection - West Bank |
| | Rock Slope Protection - Both Banks |
| | Rock Slope Protection - Bed Only |



Sources: SCVWD 2012; Bing Maps

Prepared for:
Santa Clara Valley Water District
October 2013

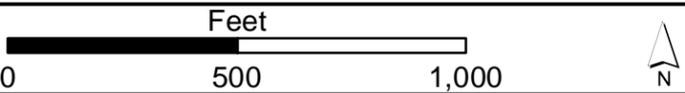
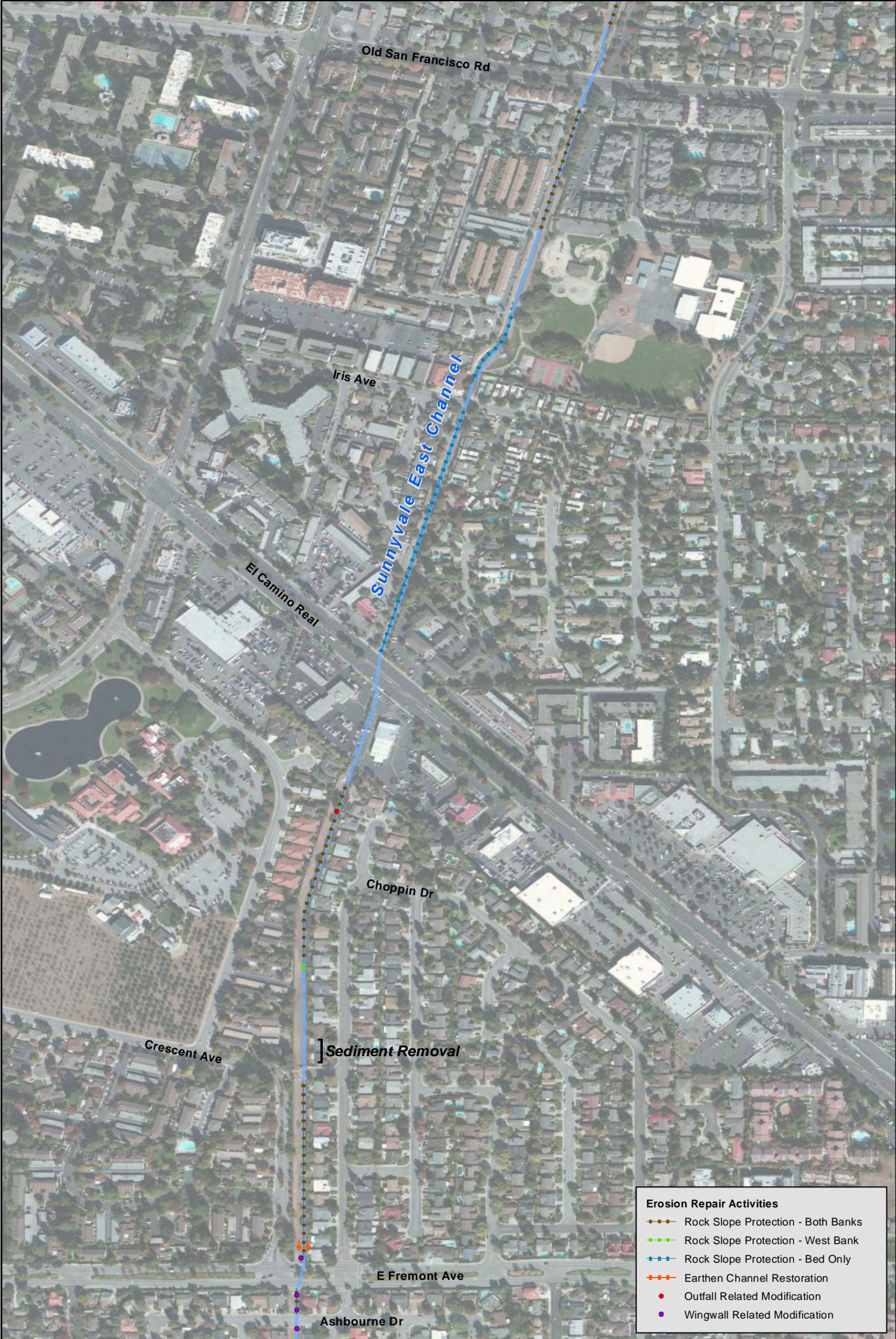


Figure 2-3g
Proposed Project Components

Sunnyvale East and West Channel Flood Protection Project



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Erosion Repair Activities	
	Rock Slope Protection - Both Banks
	Rock Slope Protection - West Bank
	Rock Slope Protection - Bed Only
	Earthen Channel Restoration
	Outfall Related Modification
	Wingwall Related Modification

Horizon
WATER and ENVIRONMENT

Prepared for:
Santa Clara Valley Water District
October 2013

Sources: SCVWD 2012; Bing Maps

Feet

0 500 1,000

N

Figure 2-3h
Proposed Project Components

Sunnyvale East and West Channel Flood Protection Project



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Sources: SCVWD 2012; Bing Maps

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October 2013

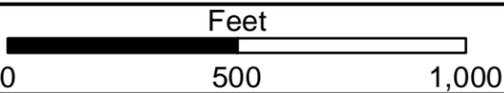


Figure 2-3i
Proposed Project Components

Sunnyvale East and West Channel Flood Protection Project

2.5.1 Project Components

Floodwalls

New vertical floodwalls would be constructed parallel to several reaches of the Sunnyvale Channels. Floodwalls would provide increased flood protection and freeboard to the extent necessary to comply with FEMA and the District's freeboard standards. These floodwalls would be located along much of the West Channel and the northern/downstream half of the East Channel (north of Hwy 101). Refer to Figures 2-3a through 2-3i for floodwall locations.

Floodwalls would be constructed along existing maintenance roads, parallel to the channels, on either the inboard side (between the maintenance road and the channel) or outboard side (outside of the channel and the maintenance road). Floodwalls may be constructed on both sides of the channel, or on only one side of the channel.

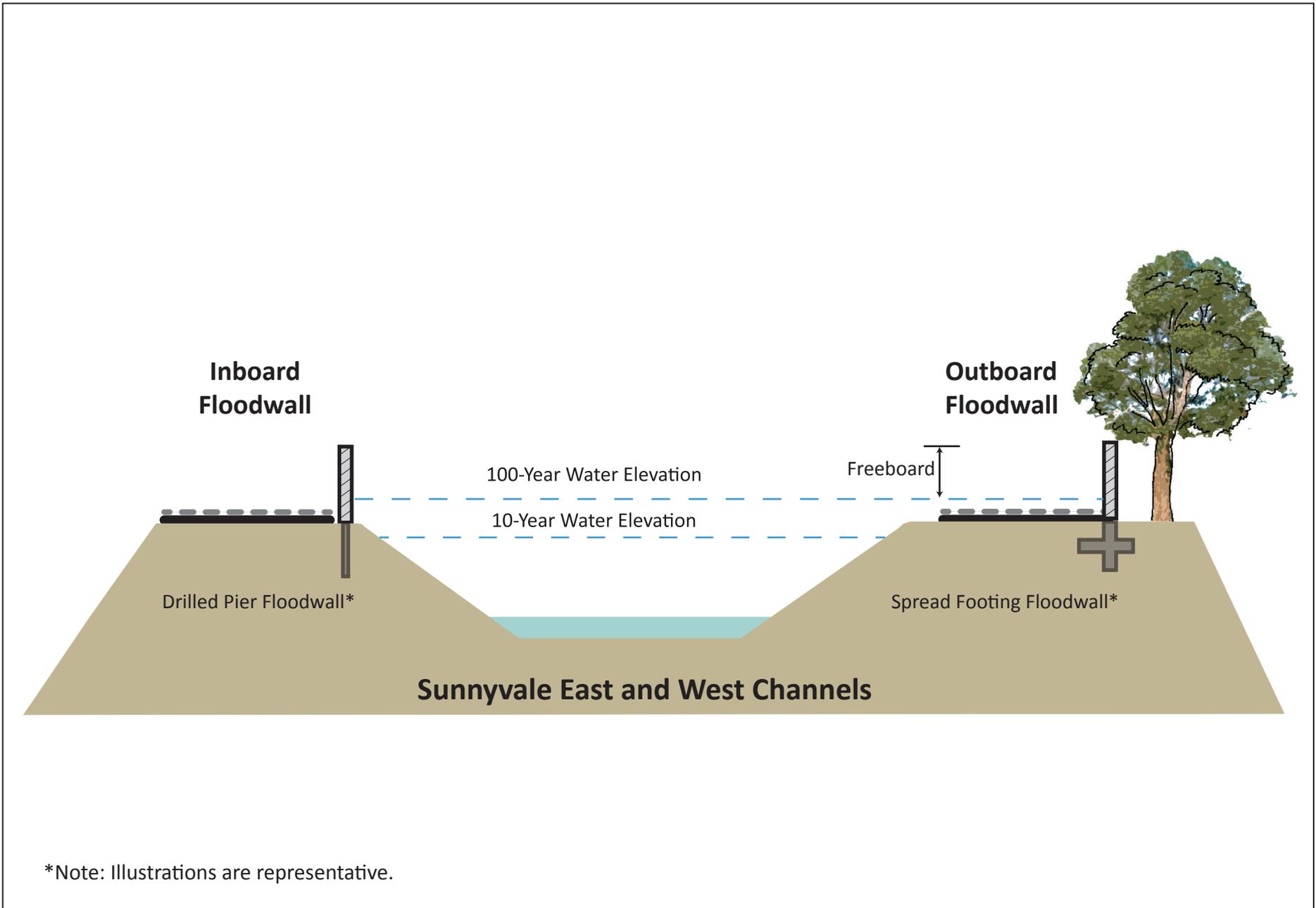
Floodwalls would be constructed of concrete or sheet pile following recommendations of the geotechnical report prepared for the Proposed Project (SCVWD 2012b). Specifically, floodwall footings would be embedded a minimum of 24 inches below the lowest adjacent finished grade, and would be designed using a site-specific approach based on USACE engineering manuals to determine bearing capacity. Concrete floodwalls would be constructed using two designs: spread footing or anchored drilled pier floodwalls. **Figure 2-4** shows typical cross-sections of the Sunnyvale Channels with proposed floodwalls installed. Floodwalls with spread footings have an "L" shape footing design, where the horizontal portion of the "L" is buried in the ground and the vertical portion extends above the ground surface to form the floodwall. Anchored drilled pier floodwalls are floodwalls that are attached to drilled piers which are installed underground. The spread footing design would be used for outboard floodwalls. Anchored drilled pier footing floodwalls may be installed where the levee width is too narrow or where utilities would interfere with a spread footing. Many of the proposed inboard floodwalls would be installed using the anchored drilled pier design. If sheet pile is used instead of concrete, spread footings or drilled piers would not be necessary.

Both sides of concrete floodwalls construction along the East and West Channels from Caribbean Drive to the downstream extent of the project (along the Bay Trail) would be treated with concrete formliners to provide an architectural surface treatment. When the floodwalls are constructed, formliners would be nailed/secured to the inside of plywood concrete forms. A releasing agent would be applied to the surface of the formliner to allow the forms to be removed after the concrete has cured to sufficient strength. The type of formliner to be used is known as fractured fin/rib or smooth flute form. This type of formliner would result in a textured surface with approximately 2-inch vertical corrugated ribbing.

Vertical floodwall heights were designed to accommodate the water surface elevation of the Sunnyvale Channels during a 100-year storm event (as discussed in Section 2.4.1, above) and the freeboard height required by FEMA and the District's freeboard standards. Floodwall heights range from about 2 to 8 feet above the ground surface, some walls would slope or ramp down to 6 inches above the ground. In general, the height of floodwalls is greater in downstream channel reaches than upstream reaches. The reach on the East Channel extending from its confluence with Guadalupe Slough to Caribbean Drive is an exception; this reach would have shorter floodwalls averaging about 3 feet high built on top of raised levees. Floodwall heights in specific reaches along the channel are shown in **Table 2-1**.

Table 2-1. Proposed Above-Ground Floodwall Heights

Figure #	Channel Roadway Crossings	Proposed Above-ground Floodwall Height
Sunnyvale East Channel		
2-3d	Confluence with Guadalupe Slough to E. Caribbean Drive	3 feet generally; about 8 feet immediately downstream of Caribbean Drive
2-3e	E. Caribbean Drive to Moffett Park Drive	4 to 6 feet generally; about 8 feet immediately upstream of Caribbean Drive
2-3e	Moffett Park Drive to SR 237	6 feet
2-3e	SR 237 to Persian Drive	6 feet
2-3e	Persian Drive to Tasman Drive	2 to 5 feet
2-3e and 2-3f	Tasman Drive to Hwy 101/Ahwanee Avenue	3 to 6 feet
2-3g	Reach extending upstream of Arques Ave for a distance of about 100 feet	1 foot
2-3g	Reach extending upstream of Evelyn Ave. for a distance of about 420 feet	4 to 6 feet
Sunnyvale West Channel		
2-3a	Near the confluence with Guadalupe Slough to Carl Road	4 to 5 feet; about 7 feet at Carl Road
2-3a	Carl Road and Caribbean Drive crossings	about 7 feet tall only along the wingwalls to conform to the raised levees between Carl Road and Caribbean Drive
2-3a	Caribbean Drive to Java Drive	5 to 6 feet generally; about 8 feet immediately upstream of Java Drive
2-3b	West Java Drive to Bordeaux Drive	2 to 6 feet
2-3b	Bordeaux Drive to Mathilda Avenue	1 to 5 feet

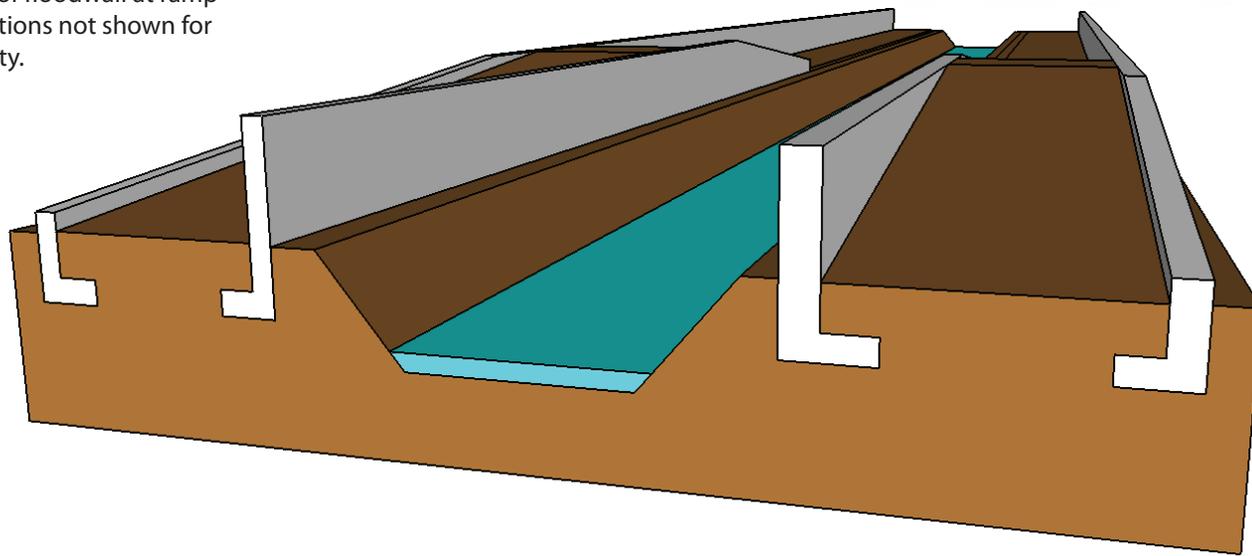


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Overview: East Channel at Highway 237 and Moffett Park Drive

NOTE: Safety fencing on top of floodwall at ramp locations not shown for clarity.



Oblique schematic of floodwall construction

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Floodwall ramps would also be constructed at several locations where floodwalls meet bridge/culvert wingwalls (walls extending along the channel from the bridge/culvert roadway). The purpose of the ramps is to provide access to the maintenance roads at road crossing. The ramps would be built to contain flow at elevations consistent with the floodwalls. These ramps would consist of earthen material constructed with two sloped ramps forming a triangular pyramid shape between floodwalls located on the outboard and inboard side of the maintenance roads. The ramps would be flattened and leveled at the top of the pyramid at the floodwall height. **Figure 2-5** provides a representative illustration of typical floodwall ramps. The ramps would be located on existing District channel maintenance roads and would allow vehicle access to channel maintenance roads, where outboard floodwalls are proposed, while providing an elevated barrier for flood protection and freeboard.

Levee Modifications

Levee Raising

Existing levees would be raised at two locations to increase flood protection and freeboard to comply with FEMA and the District's freeboard standards. Specifically, levees would be raised for approximately 100 LF of the West Channel south of Pond A4 and immediately east of the City of Sunnyvale WPCP (Figure 2-3a) and along the East Channel from Caribbean Drive to the confluence with Guadalupe Slough (approximately 3,900 LF). The purpose of the levee raising on the East Channel is to reduce the required floodwall height, allowing for an average floodwall height of 3 feet (ranging between 2-4 feet). Levees would be raised from 3 to 5.5 feet by placement of earthen fill. All levees side slopes would be graded to a 2:1 slope. The top surface of the levees would be leveled with new aggregate base rock and would continue to serve as the District maintenance road. Sloped levee ramps would also be constructed to allow vehicle access onto the raised levees. **Figure 2-6** provides a representative illustration of proposed levee raising.

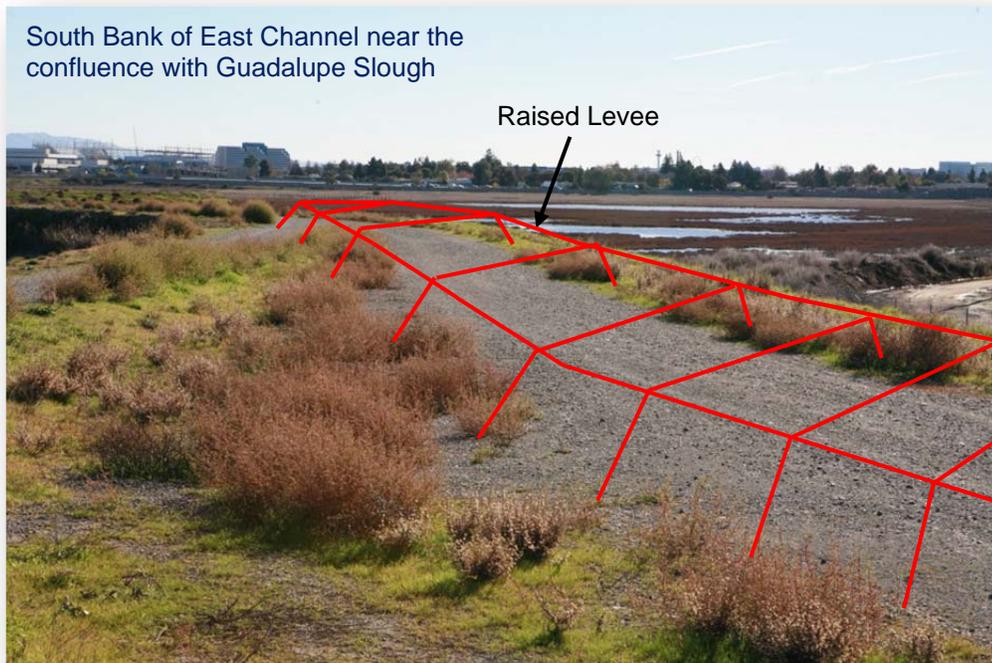
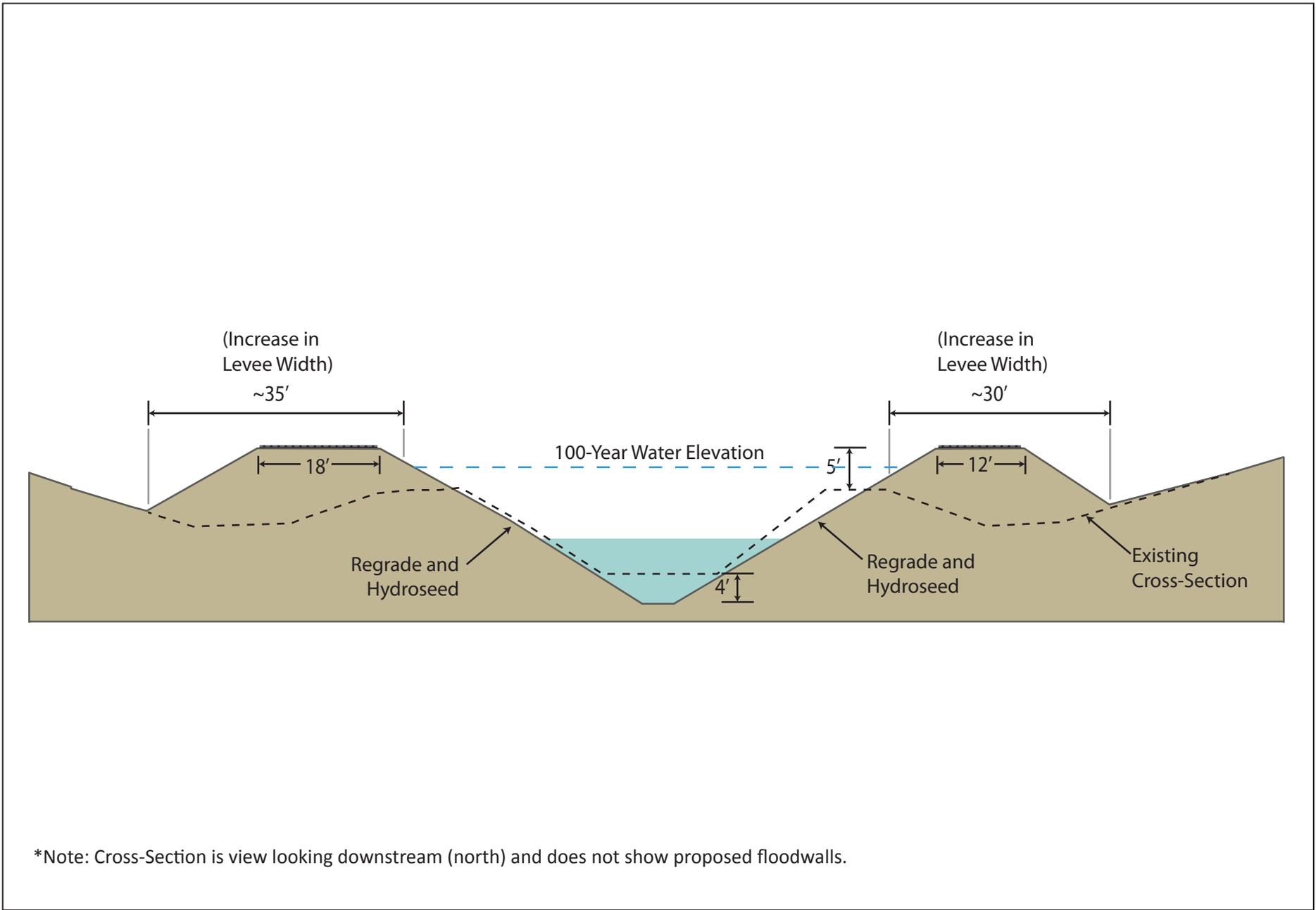


Figure 2-6. Representative Levee Raising

Levee Enlargement on Sunnyvale West Channel

Existing levees would be enlarged along the West Channel, between Carl Road and Caribbean Drive, on both the east and west banks (Figure 2-3a). The levee is being enlarged to accommodate the water surface elevation of the West Channel during a 100-year storm event (as discussed in Section 2.4.1, above) and the freeboard height required by FEMA and the District's freeboard standards. **Figure 2-7** illustrates the proposed levee enlargement along the West Channel. The levee enlargement would consist of 1) raising the existing vertical levee height of both levees by 5 feet; 2) lowering the channel bed elevation by 4 feet to restore historic channel invert profile; 3) widening the east and west levees outward approximately 25 feet to accommodate emergency vehicle access. The levees would be enlarged with the placement of earthen fill. Levee sides would be graded to a 2:1 slope for channel stability. The top surface of the levees would be leveled with new aggregate base rock and would continue to serve as a channel maintenance road for the District. The levee surface/maintenance road along the west bank, between Carl Road and Caribbean Drive, would serve as a permanent emergency access route for the City of Sunnyvale landfill and WPCP.

Sloped levee ramps would also be constructed to allow vehicle access on to the enlarged levees. These ramps would be constructed similar to floodwall ramps, such that floodwalls are located on the inboard side of the ramp to provide an elevated barrier for flood protection and freeboard. However, levee ramps would only provide one slope surface (from the ground to the top levee surface), whereas floodwall ramps provide two sloped surfaces in a triangular pyramid shape.



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Levee Enlargement on Sunnyvale East Channel

The West levee along the East Channel from Moffett Park Drive to Caribbean Drive would be widened to provide sufficient maintenance access road width. This reach of the channel has a drainage ditch that runs parallel to the East Channel. The ditch has a bench at a lower elevation than the existing levee height along the East Channel. The bench between the ditch and the East Channel levee would be filled, thus widening the East Channel levee. The existing levee would be enlarged by approximately 3-5 feet for approximately 2500 linear feet, by placement of earthen fill with side slopes graded 2:1. The top surface of the levee would be leveled with new aggregate base rock for continued maintenance road access. **Figure 2-7** illustrates this proposed levee enlargement.

The East levee along the East Channel extending North of Caribbean Drive would also be widened by a maximum of about 10 feet for a distance of about 250 feet. This levee widening is needed to provide an adequate maintenance road width near Caribbean Drive.

Maintenance Road Modifications

Maintenance Road Improvements

Existing channel maintenance roads would be elevated, leveled, and typically surfaced with between 4 and 6 inches of new base rock. Maintenance road improvements are generally intended to improve the conditions of existing roadways.

The District may pave several stretches of its existing gravel maintenance roads. However, most of the channel maintenance roads would remain unpaved.

Bridge and Culvert Modifications

Bridges and culverts would be modified at several roadway crossings (crossings) of the Sunnyvale Channels. Modifications are intended to increase stream flow capacity and reduce historic bridge overtopping and culvert backwatering, which has occurred as a result of insufficient capacity. Bridge and culvert modifications would also increase freeboard to the extent necessary to comply with FEMA and the District's freeboard standards. Modifications are currently proposed at eight crossings along the East Channel and four crossings along the West Channel (Figures 2-3a through 2-3i and **Table 2-2**). Several different types of bridge/culvert modifications are proposed, as discussed below.

Table 2-2. Proposed Bridge/Culvert Modifications

Figure #	Roadway Crossing	Proposed Modification
Sunnyvale East Channel		
Fig 2-3d: E1	Caribbean Drive	Demolish existing dual span bridge and replace with larger triple-cell box culvert bridge. Construct headwalls extending approximately 7 to 8 feet above existing road elevation. Construct wingwalls to transition from the concrete box to the natural channel extending upstream and downstream of the bridge crossing.
Fig 2-3e: E2	Moffett Park Drive	Raise headwall by 2 feet on downstream end of Moffett Park Drive crossing and by 1 foot on the upstream end of Moffett Place Dr.
Fig 2-3e: E3	SR 237	Raise headwall by 1 foot on the upstream and downstream ends of SR 237 crossing.
Fig 2-3e: E4	Persian Drive	Raise headwall by 1 foot on the upstream end of the Persian Drive crossing.
Fig 2-3e: E5	Tasman Drive	Raise headwalls by approximately 2 feet on the upstream and downstream faces of Tasman Drive crossing.
Fig 2-3f: E6	Duane Ave	Raise the headwall by 1 foot on the upstream face.
Fig 2-3g: E7	East Arques Avenue	Demolish existing sidewalk/gutter and install 16-foot sidewalk/driveway. Raise headwall on the upstream end of East Arques Avenue crossing by 1 foot.
Fig 2-3g: E8	East Evelyn Avenue	Raise headwall by about 5 feet on the upstream end of East Evelyn Avenue crossing.
Sunnyvale West Channel		
Fig 2-3a: W1	Carl Road	Demolish existing single box culvert bridge and reconstruct a larger single box culvert bridge. Construct new headwalls at the downstream and upstream ends of Carl Rd. Construct new wingwalls at the downstream and upstream ends of Carl Rd.
Fig 2-3a: W2	Caribbean Drive	Demolish existing 5 foot tall headwalls and reconstruct headwalls on the upstream and downstream ends of Caribbean Drive crossing. Finished height of headwalls would be about 7 feet.
Fig 2-3a: W3	West Java Drive	<ol style="list-style-type: none"> 1. The existing box culvert would be extended 15 feet along the channel from the upstream face and 5 feet from the downstream face, to accommodate new sidewalks. 2. Raise headwalls by 4 feet on the upstream and downstream ends of West Java Drive crossing. 3. Rebuild wingwalls for a length of 15 feet upstream and 25 feet downstream of the new box culvert extension.
Fig 2-3b: W4	Bordeaux Drive	Install driveway cut and apron and add 1 foot headwalls on upstream and downstream ends of Bordeaux Drive crossing.

Bridge/Culvert Reconstruction

On Sunnyvale East Channel at Caribbean Drive, the existing dual-span bridge would be completely replaced with a slightly larger triple-cell box culvert bridge, as illustrated in **Figure 2-8**. The culvert box cells would be aligned with the existing channel direction. The individual box cells would have a vertical height of 9.5 feet and a width of 18.3 feet, resulting in a total width of about 57 feet for all three box cells (when the interior wall widths are included). The bottom of the box cells would be buried 1.8 feet below the existing channel bed grade. Compared with the existing bridge structure, the new triple-cell box culvert structure would extend 8 feet wider on both the upstream and downstream sides of the existing bridge crossing. This additional 8 feet on both sides is requested by the City of Sunnyvale for routing a future sidewalk along Caribbean Drive.

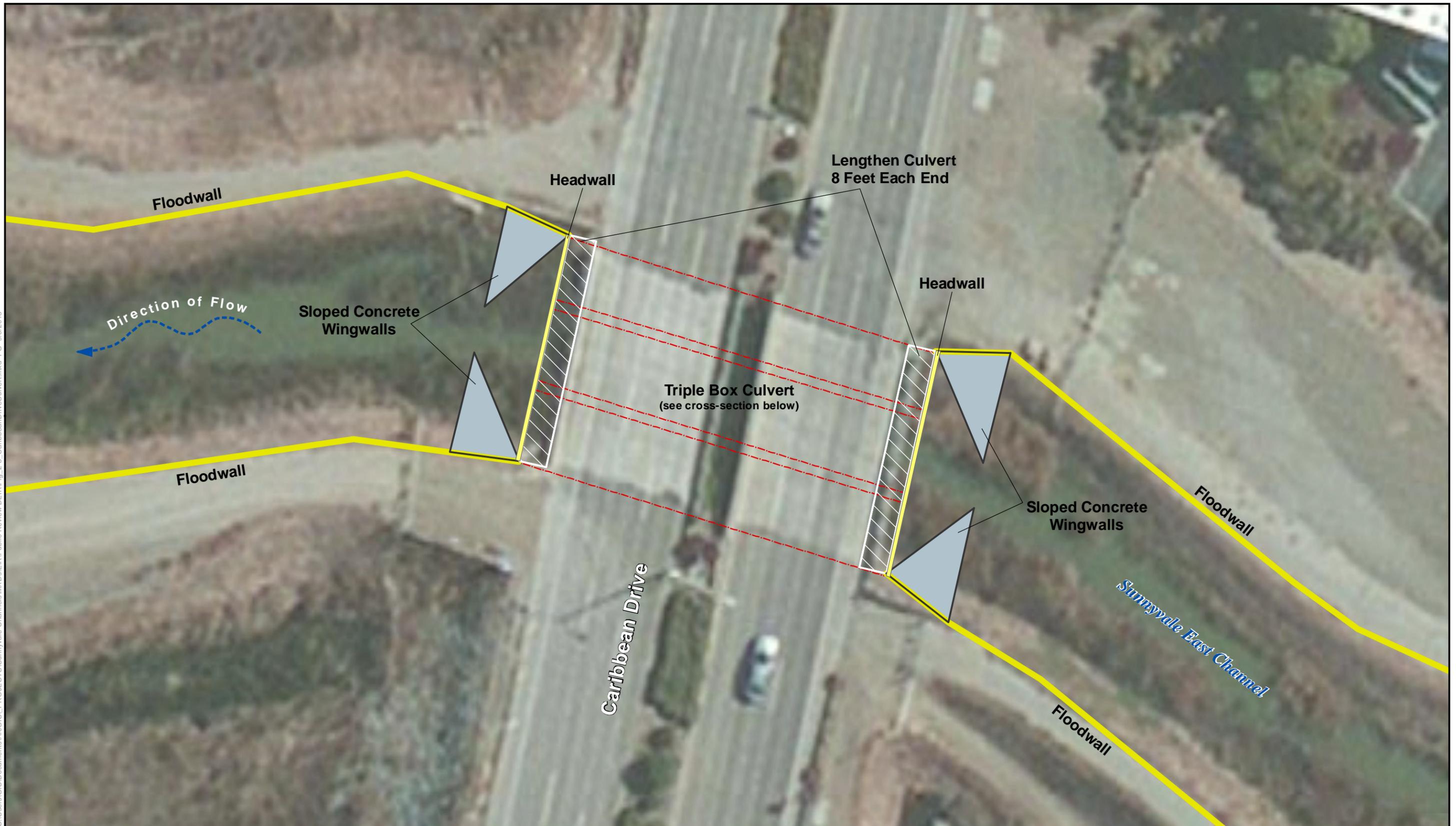
New warped concrete wingwalls would also be constructed along both banks of the East Channel, at both the upstream and downstream sides of the bridge crossing. The warped wingwalls have been designed to transition between the natural channel cross section and the wider triple cell box culvert (bridge crossing). This box culvert has been designed to maximize its flow capacity to reduce the water surface upstream, since the culvert would have a pressurized flow condition during the 100 year event. The pressurized flow condition is a result of the box culvert's low soffit elevation required to maintain the existing Caribbean Drive road way elevation. Raising Caribbean Drive roadway would change the road profile resulting in the redesign of the existing roadway transitions to and from the crossing, significantly impacting adjacent properties. This design, coupled with high headwalls and floodwalls, prevents overtopping of the triple box culvert structure. This design was evaluated during the hydraulic design analysis.

Headwalls about 7 to 8 feet tall would also be constructed on top of new box culverts to provide adequate freeboard and prevent flow from overtopping the road during a 100-year storm event.

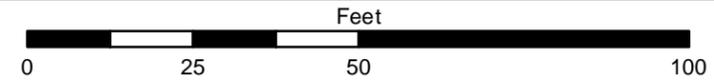
On the West Channel, the existing box culvert at Carl Road would be completely replaced with a new, slightly larger box culvert, as illustrated in **Figure 2-9**. All water flowing downstream would pass through the single box culvert. The new box culvert would be 10 feet by 15 feet to replace the existing 9 foot by 10 foot box culvert. The bottom of the box culvert is assumed, for hydraulic modeling purposes, to be buried with approximately 3 feet of channel bed sediment due to tidal flows. The box culvert would be buried so that its bed elevation would not be higher than the bottom elevation of the wingwalls at the Caribbean Drive culvert located upstream. The existing wingwalls extending from the Carl Road crossing are constructed of concrete with a vertical extension about 2-3 feet high made of sacked concrete; the vertical extension was added when the ground level in this area was raised with fill. These existing wingwalls would be demolished and reconstructed with concrete. Although the wingwalls would have a vertical extension to provide adequate freeboard above the 100-year flood water surface elevation, no additional channel bank area would be developed for wingwalls.

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Prepared for:
 Santa Clara Valley Water District
 October 2013



Sources: SCVWD 2013

Figure 2-8
Proposed Caribbean Drive Bridge and Culvert Reconstruction

Sunnyvale East and West Channel Flood Protection Project

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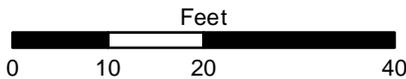


Figure 2-9
Proposed Carl Road
Bridge and Culvert Reconstruction

Sunnyvale East and West
Channel Flood Protection Project

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Raising of Headwalls

Existing headwalls (concrete walls extending vertically from the road crossing over the channel) would be raised with new concrete. Concrete would either be added to existing headwall structures, or existing headwall structures would be demolished and new concrete headwalls would be constructed at a higher elevation. Headwalls would be raised at 8 roadway crossings of the East Channel and 4 roadway crossings of the West Channel. Headwalls proposed for East Channel road crossings are: 1) Caribbean Drive; 2) Moffett Park Drive; 3) SR 237; 4) Persian Drive; 5) Tasman Drive; 6) Duane Ave; 7) East Arques Avenue; 8) East Evelyn Avenue. Headwalls proposed for West Channel road crossings are: 1) Carl Road; 2) Caribbean Drive; 3) West Java Drive; and 4) Bordeaux Drive. **Figure 2-10** provides a representative illustration of the proposed headwall raising. Table 2-2 lists heights of the proposed headwalls at the road crossings listed above along with a key for identifying their locations on the Figure 2-3 maps.



Figure 2-10. Representative Raised Headwall

West Java Drive Sidewalk Construction

The existing West Java Drive box culvert would be extended for a distance of 15 feet upstream and 5 feet downstream of the existing bridge faces, to accommodate new sidewalks. The existing wingwalls would be demolished and reconstructed at the relocated culvert faces.

East Arques Avenue Maintenance Driveway Modification

A minor modification would be made to the East Arques Avenue crossing of the East Channel. The existing sidewalk/gutter on the downstream face of East Arques Avenue

crossing would be demolished and a new 16-foot sidewalk/driveway would be installed. All of this work would be completed on/adjacent to East Arques Avenue.

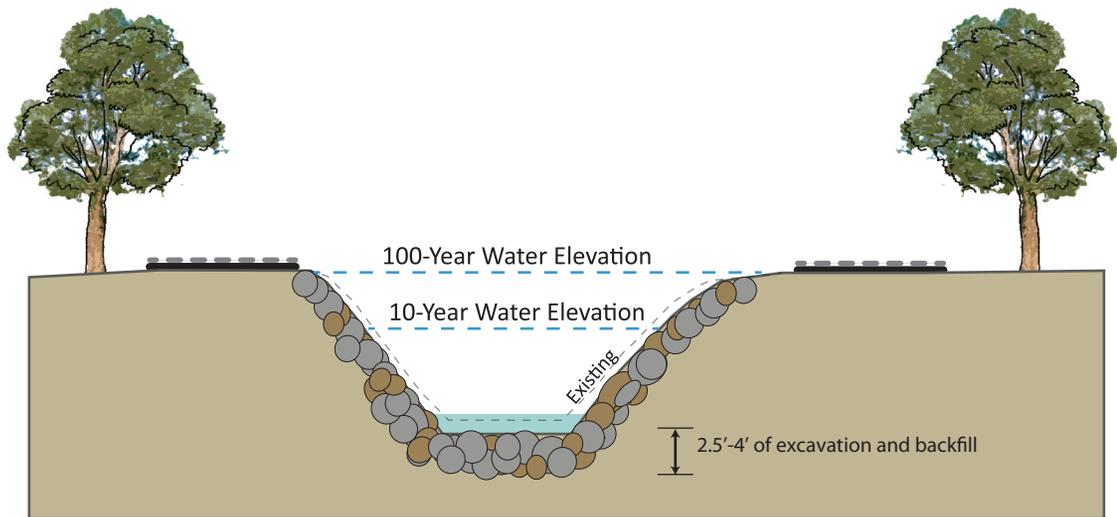
Bordeaux Drive Ramp Modification

A minor modification would be made at the Bordeaux Drive crossing of the West Channel. New roadway ramps would be installed between Bordeaux Drive and the District's channel maintenance road, on both the upstream and downstream side of Bordeaux Drive. Specifically, the existing roadway would be cut and a new concrete ramp would be installed along each side of the road. All of this work would be completed on Bordeaux Drive and the maintenance roads.

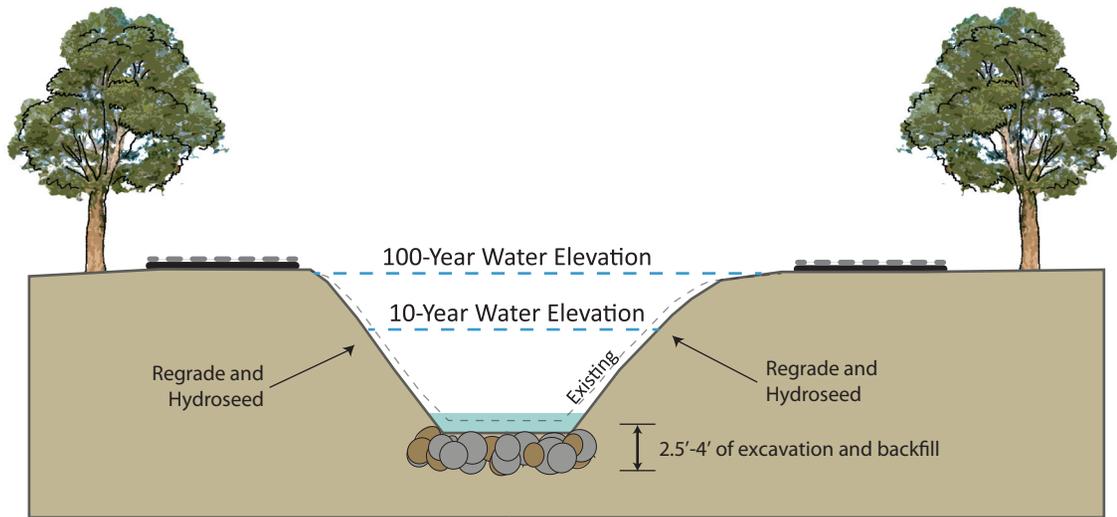
Rock Slope Protection on Stream Banks

Eroding stream banks, as well as stream banks vulnerable to erosion, would be stabilized by placing rock material in the channel. Rock slope protection would be used at several locations along the Sunnyvale Channels (see Figures 2-3a through 2-3f). A few variations of rock slope protection are proposed. Most commonly, rock would be placed along both channel banks and the channel bed. In other instances, rock would be placed along one bank only and the channel bed, or rock would be placed on the channel bed only and not on either channel bank. **Figure 2-11** provides representative channel cross-sections of the different methods of proposed rock slope protection. The District performed a hydraulic analysis of erosion potential based on discharge, flow velocities, and shear stress to identify the locations and sizing of rock placement.

California Department of Transportation (Caltrans) light class rock—large rocks with an average diameter of approximately 1.3 feet—would be used for all rock slope protection. Rock would be installed on channel banks and beds to a depth/width of between 2.5 and 4 feet. Where rock is installed on the channel banks, rock would extend up to the top of bank where 1.5:1 (horizontal:vertical) sloped banks are present, up to the 10-year storm event water level where 2:1 (horizontal:vertical) sloped banks are present, or in tidal reaches up to the mean higher high-water level. Above the rock, the banks would be regraded to a stable slope angle, back filled with earth, as necessary, and covered with erosion control fabric. Hydro-seeding would be applied to establish a protective layer of vegetation. Where rock is installed on the channel bed, excavated sediment from the channel would be placed on top of the rocks to fill voids between them. However, the rock would not be completely buried.



Rock Slope Protection on Banks and Bed



Rock Slope Protection on Bed only

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Bench Construction with Rock

Whereas the rock slope protection techniques discussed above do not alter the channel shape when placing rock material, the “bench construction with rock” treatment uses an approach of regrading the earthen channel to a less vertical channel bank in combination with rock placement. This treatment would be used to stabilize existing eroding banks and improve flow of flood waters between Hwy 101 and Blythe Avenue on the East Channel (Figure 2-3f). An instream bench would be cut into the east bank of the channel, and the eroding earthen stream banks would be regraded to a less steep and more stable bank slope. Bench construction would involve expanding the channel grading along the bank to shift the existing stream bank or levee outward. The banks above and below the bench would have a 2:1 (horizontal:vertical) side slope. A bank full channel would be created in these locations to improve water and sediment conveyance during lower flow conditions. Rock would be installed along all of the channel bed and banks up to the top of the bank on each side of the channel, as discussed above for rock slope protection.

Sediment Removal

Sediment would be removed from four locations along the East Channel and one location on the West Channel where excessive sediment has aggregated over time and reduced channel capacity. Removal of this sediment would be conducted together with other Project components identified in the same channel reaches. **Table 2-3** identifies the location and extent of sediment removal activities proposed by the Project.

Table 2-3. Proposed Sediment Removal Activities

Location	Extent of Sediment Removal	
	Length (linear feet)	Quantity (cubic yards)
Sunnyvale East Channel		
Between Persian Drive and Tasman Drive	15	10
Between Central Expressway and Kifer Road	170	380
Between El Camino Real and Crescent Avenue	90	70
Between Carlisle Way and Dunholme Way	100	75
Sunnyvale West Channel		
Between Carl Road and Caribbean Drive	520	925

Other Modifications

Under the Proposed Project, a few additional modifications would be provided at several locations, as discussed below and shown in Figures 2-3a through 2-3i.

Outfall Bank Stabilization

To prevent flows from undermining existing outfall structures (pipe outlets that discharge stormwater into the channels), concrete would be installed at several locations along the Sunnyvale Channels. Modifications would be limited to the channel area immediately adjacent to existing outfall structures; however, the outfall structures themselves would not be modified. Concrete and slurry would be installed on the channel bank to support outfalls, thereby repairing existing erosion and preventing future erosion and undercutting of the outfall structures. In most locations, existing slope protection features, such as sacked concrete or rock, would be removed prior to repair.

Wingwall Bank Stabilization

To prevent flows from undermining existing wingwall structures, concrete would be installed at several locations along the Sunnyvale Channels. Modifications would be limited to the channel area immediately adjacent to existing wingwall structures; however, the wingwall structures themselves would not be modified. Concrete and slurry would also be installed at the interface of existing wingwalls and the channel, thereby repairing existing erosion and preventing future erosion and undercutting of the wingwalls. In most locations, existing slope protection features, such as sack concrete or rock, would be removed prior to repair.

Concrete Channel Lining

A concrete trapezoidal channel would be constructed within an existing channel reach on the East Channel, between East Duane Avenue and North Wolfe Road. Severe erosion currently occurs throughout this reach and existing sack concrete slope protection is failing in several places. Existing concrete, rock slope protection, and sack concrete covering a portion of this channel would first be removed. Then additional material would be excavated from the channel to accommodate the trapezoidal concrete structure installed along the entire channel bottom and toe up to the bank.

Low-Flow Notches

Low-flow notches would be cut into an existing concrete channel encapsulation located on the East Channel, between Iris Avenue and El Camino Real. The channel encapsulation is a concrete box-type structure that is causing ponding of water in the East Channel during low-flow conditions. The Project may propose to cut notches into the encapsulation at several locations to improve flow conditions.

Chain Link Fence Installation

A chain link fence would be installed at all floodwall ramp locations to comply with applicable building codes and on the West Channel, between Hwy 101 and Almanor Avenue. The fences would be located on the inboard or outboard side of the floodwall ramps or existing channel maintenance road. Between Hwy 101 and Almanor Avenue along the West Channel, vegetation removal would be required from this area prior to fence installation.

Retaining Walls

Buried retaining walls would be constructed at a few locations to preserve the existing maintenance road width and to protect the maintenance roads from erosion. The walls would conform with and be flush to the existing maintenance road grade, or would extend no greater than 6-inches above the existing maintenance road grade. The function of the buried retaining walls is to prevent further erosion of existing maintenance roads.

Property Acquisitions

Currently, the District does not have adequate right-of-way to accommodate all of the proposed floodwall construction. Temporary construction or permanent easements would be obtained from several parcels along both Sunnyvale Channels. **Table 2-4** identifies permanent and temporary property acquisitions proposed for the Project, including information of the size and duration of the District's acquisition. Each of the property acquisitions is also shown on Figures 2-3a through 2-3i. Temporary construction easements (TCEs) would be used for short-term staging of construction equipment and stockpiling of construction materials. Fee/easement parcels would be obtained by the District for permanent right-of-way, where floodwalls would be located outside of the District's existing right-of-way.

Table 2-4. Proposed Permanent and Temporary Property Acquisitions

Figure #/ Site ID	Type of Property Acquisition	Acreage Acquired	Duration of Acquisition
Sunnyvale East Channel			
Fig 2-3d: Site 10	Permanent Easement	0.59	Permanent
Fig 2-3f: Site 11	Permanent Easement	0.04	Permanent
Fig 2-3d: Site 12	TCE/Staging Area	0.87	30 months
Fig 2-3d: Site 15	TCE/Staging Area	0.74	30 months
Fig 2-3i: Site 16	TCE/Staging Area	0.25	30 months
Fig 2-3d: Site 17	TCE/Staging Area	1.29	30 months
Sunnyvale West Channel			
Fig 2-3a: Site 1	Permanent Easement	0.13	Permanent
Fig 2-3a: Site 2	Permanent Easement	0.22	Permanent
Fig 2-3a: Site 3	TCE/Staging Area	0.07	3 months
Fig 2-3a: Site 4	TCE/Staging Area	0.11	3 months
Fig 2-3b: Site 5	TCE/Staging Area	0.15	6 months
Fig 2-3b: Site 6	TCE/Staging Area	0.27	6 months
Fig 2-3b: Site 7	TCE/Staging Area	0.11	6 months
Fig 2-3c: Site 8	TCE/Staging Area	0.44	3 months

Figure #/ Site ID	Type of Property Acquisition	Acreage Acquired	Duration of Acquisition
Fig 2-3c: Site 9	TCE/Staging Area	0.61	6 months
Fig 2-3a: Site 13	TCE/Staging Area	3.29	30 months
Fig 2-3a: Site 14	TCE/Staging Area	3.58	30 months

Notes: TCE = temporary construction easement

2.5.2 Channel Maintenance Activities

Following Project construction, future routine maintenance activities at the Sunnyvale Channels may include trash and debris removal, vegetation management, graffiti removal, bank repairs, and minor sediment removal to periodically clear culverts. These activities are similar and consistent with the District's stream maintenance activities that have been conducted at the Sunnyvale Channels in past years. Because the Proposed Project includes repairing destabilized streambanks at several locations along the Sunnyvale Channels, this would reduce future maintenance needs including sediment removal and bank repairs. None of the Proposed Project activities are expected to increase maintenance needs. Rather, the Proposed Project is anticipated to result in less maintenance.

The District conducts its routine maintenance activities in flood control channels according to its Stream Maintenance Program (SMP). The SMP includes a recently updated Program Manual that describes routine maintenance activities, protocols, impact avoidance measures, best management practices (BMPs), mitigation requirements, monitoring, and program management.

The District recently conducted CEQA compliance on the 2012-2022 SMP Update process. A Subsequent EIR (SEIR) for the SMP was approved and certified by the District in February 2012 (SCVWD 2012c). The SMP Update SEIR includes several impact avoidance and minimization measures, as well as best management practices (BMPs), to reduce potential impacts on resources from routine maintenance activities. Activities associated with existing and future maintenance of the Sunnyvale Channels are included and evaluated in the SMP's 2012 SEIR. The 2012 SMP SEIR is incorporated in this EIR by reference, per CEQA Guidelines Section 15150.

The executive summary from the 2012 SMP SEIR, which includes a summary of impacts identified in the SEIR, is included in **Appendix C**. The complete SEIR is available for review online: <http://valleywater.org/Services/StreamMaintenanceProgram.aspx>. In the resource evaluation sections included in this EIR (Chapter 3), the reader is directed to specific sections of the 2012 SMP SEIR to review the discussion of routine maintenance activities and potential impacts.

A review was completed of the previous maintenance activities conducted under the District's SMP prior to the 2012 program update. **Appendix C, Table C-1** lists the

frequency and type of maintenance activities conducted in Sunnyvale East and West Channel reaches between 2002 and 2012. **Appendix C, Figure C-1** indicates the locations of vegetation management and sediment removal activities conducted in the Sunnyvale East and West Channels between 2002 and 2012. As noted above, routine activities including vegetation management and sediment removal are expected to continue after Project construction under the 2012-2022 SMP update. While many of the future maintenance activities are expected to continue both in type and location as in the past 10 years, an estimate of potential future sediment removal areas was conducted in consideration of where improvements to channel infrastructure may require maintenance work in different locations due to changes in the hydraulic regime. Those locations estimates are noted in **Appendix C, Figures C-2 and C-3**.

While specific maintenance activities for the post-Project conditions in the Sunnyvale Channels can only be estimated at this time, the SMP SEIR addresses the complete range of potential maintenance activities that could be conducted at the Sunnyvale Channels.

2.5.3 Project Construction

Construction of all Project components and sediment removal would occur within a designated Project Work Area. This Project Work Area would consist of the channels themselves; the channel easements and the District's existing right-of-way; and proposed property acquisitions, including for temporary construction staging areas (refer to Table 2-4 above). The channel easement and existing District right-of-way along the Sunnyvale Channels generally consists of an approximately 25-foot corridor extending from the top of each bank. Additionally, several staging areas are located outside of this channel corridor. In-channel construction would occur between the top of each channel bank and/or on the channel bed. Out-of-channel construction would occur adjacent to channel banks in the channel corridor area containing existing channel maintenance roads and some sparse vegetation. In many locations, existing structures and development adjacent to the Sunnyvale Channels would restrict where Project activities could occur. As a result, urban development often restricts Project construction to an area smaller than 25 feet from the top of the channel bank. The exact location and extent of construction occurring along a channel reach depends on the specific Project components proposed along the reach.

Construction Phasing

Construction of the Proposed Project is planned to take place over the summers of 2014 and 2015. In both years, the work window is expected to begin around May 1st and continue through about November 1st. All project construction would comply with periods specified in Project regulatory permits (e.g., for protection of biological species and water quality). Work in the channel easements, such as for floodwalls, maintenance and levee rising, and some bridge/culvert modifications, would generally occur anytime during the annual construction window. In-channel work, such as rock slope protection,

outfall and wingwall bank stabilization, concrete lining of the channel, sediment removal, and channel excavation for bridge reconstruction would occur during the driest time of the year, approximately between June 1st and October 1st or as otherwise allowed by Project regulatory permits.

Construction would only take place during the work week, with standard holiday breaks. Construction would last up to 8 hours per day and only typically occur during daylight hours (between 8 a.m. and 5 p.m.). Nighttime work would occur as necessary, such as for construction requiring temporary closure of a highway lane. Construction crews would work concurrently on both Sunnyvale Channels. It is estimated that Project construction would employ a total of 66 workers on any given day. The crews would construct the Proposed Project as follows:

- **Floodwalls and concrete crews.** Crews on each Sunnyvale Channel (estimated 33 workers total) would construct floodwalls, floodwall ramps, levee modifications, bridge/culvert modifications (except for Caribbean Drive reconstruction), wingwall and outfall bank stabilization, the concrete channel lining, low-flow notches, and the chain link fence. Each crew would generally begin at the downstream end of the Project site, at the confluence of the Sunnyvale Channels with Guadalupe Slough, and progress upstream by reach. However, on the West Channel, the Carl Road to Caribbean Drive reach would be constructed before the reconstruction of the Carl Road bridge. This approach allows the City of Sunnyvale to use the west bank levee/maintenance road to access treatment ponds associated with the City's WPCP during reconstruction of the Carl Road bridge.
- **In-channel and road crews.** Crews on each Sunnyvale Channel (estimated 23 workers total) would construct channel excavation (for rock slope protection, earthen channel repairs, sediment removal); installation of rock protection; and maintenance road modifications. Maintenance road modifications would only be constructed after channel excavation and installation of rock protection is completed. Furthermore, the in-channel crews would complete construction of reaches before the out-of-channel crew begins works. As such, in-channel and road crews and floodwall and concrete crews would never work on the same reach at the same time, and the floodwalls and concrete crews would typically work ahead/upstream of the in-channel crew.
- **Caribbean Drive bridge reconstruction crew.** One crew (estimated 10 workers total) would reconstruct the Caribbean Drive bridge crossing of the East Channel. Half of the Caribbean Drive bridge (either westbound or eastbound lanes) would be reconstructed during the summer of 2014 and the other half during the summer of 2015. As such, reconstruction of the Caribbean Drive bridge crossing of the East Channel would occur during both years of Project construction.

Construction Details

Construction Activities and Equipment

A variety of construction activities are necessary for the different Project components. While the types of construction activities undertaken are specific to different Project components, several activities are common among the different Project components. Common construction activities for several Project components include shallow excavation from the channel banks and bed and channel easements, resurfacing of existing rock maintenance roads, installation of new rock on the channel banks and bed, installation of concrete and concrete slurry in the channel, demolition of existing channel protection hardscape features (i.e., rock, sack concrete, and concrete), and installation of concrete at bridge/culvert crossings. **Table 2-5** provides an overview of construction activities for each Proposed Project component, including the technique, construction area, and necessary equipment. At each location where a Project component is proposed, the construction details presented in Table 2-5 would be completed.

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Table 2-5. Project Construction Overview

Project Component	Construction Activities	Construction Technique	Construction Area	Construction Equipment
Floodwalls	Floodwalls <i>(inboard and outboard locations)</i>	1. Floodwall excavation	Excavation of soil at locations where new floodwall footings would be installed.	<p><u>Width:</u> Excavation would extend over an approximately 6-foot wide horizontal area for floodwall footings. The excavated area would primarily line up over the horizontal footing of “L” shaped spread floodwalls.</p> <p><u>Depth:</u> Spread floodwalls would be excavated to a depth of 6.5 feet; drilled piers for anchored floodwalls would be excavated to a depth of 3.5 to 18.5 feet.</p>
	2a. Concrete floodwall: structural installation (alternative to sheet pile floodwall installation)	Installation of forms, rebar, reinforcements, and formliners for floodwalls.	Structural components are installed within the excavated floodwall footprint.	Flatbed boom truck, concrete trucks, front end loader, vibratory roller, water truck, air hoses & compressor
	2b. Concrete floodwall: concrete installation (alternative to sheet pile floodwall installation)	Concrete is poured in formliners and finished, and then forms are removed.	Concrete is installed within structural forms and formliners. 5 feet (width) of excavated soil is replaced to stabilize floodwalls; floodwalls are 1 foot wide.	Flatbed boom truck, concrete trucks, front end loader, vibratory roller, water truck, air hoses & compressor
	3. Sheet pile floodwall installation (alternative to concrete floodwall installation)	Sheet pile floodwalls are erected and excavated soil is replaced to stabilize installed floodwall.	Floodwall is installed within excavated floodwall footprint.	Excavator with vibratory hammer, dump trucks, flatbed boom truck, front end loader, vibratory roller, & semi flatbed truck. No pile driving would occur.
	Floodwall ramps	Erecting of floodwall ramps	Fill material is used to build floodwall ramps.	On District’s existing channel maintenance roads, between inboard and outboard floodwalls.

Project Component		Construction Activities	Construction Technique	Construction Area	Construction Equipment
Levee Modifications	Levee Raising	Levee raising	Placement of fill and resurfacing of road with aggregated base rock. Conform to existing grade.	On District's existing channel maintenance roads.	Front end loader, grader, tractor/dozer, vibratory roller with blade, & water truck.
	Levee Enlargement	1. Levee raising, widening and grading	Placement of fill material to raise and widen new levee and re-grading of levee/channel slopes.	Between: approximately 35 feet from outboard edge of the existing west bank maintenance road and approximately 30 feet on the outboard edge of the existing east bank maintenance road.	Front end loader, grader, tractor/dozer, vibratory roller with blade, & water truck
		2. Channel excavation	Excavation of sediment and removal of vegetation from the channel.	Within the existing channel and regarded levee slopes.	Excavator, dump trucks, front end loader and water truck
		3. Erosion control and re-vegetation	Installation of erosion control fabric, hydroseeding and planting, as necessary.	Upper portion of regarded channel banks.	Broadcast sprayer and truck
	Levee Ramps <i>(for both levee raising and enlargement)</i>	Erecting of levee ramps	Placement of fill material to build levee ramps.	On District's existing and newly developed levees/ maintenance roads.	Front end loader, grader, tractor/dozer, vibratory roller with blade, & water truck.
Maintenance Road Modifications	Maintenance Road Improvements	Road resurfacing and widening	Placement of fill material, if necessary, and resurfacing of road with aggregated base rock. Conform to existing grade.	On District's existing channel maintenance roads.	Double bottom dump trucks, grader, tractor/dozer, front end loader, vibratory roller, & water truck.
	Maintenance Road Paving	Maintenance road paving	Resurfacing of existing maintenance roads with asphalt concrete.	Work would occur on select channel maintenance roads and only after road raising is completed	Double bottom dump truck, grader, tractor/dozer, front end loader, vibratory roller, & water truck.

	Project Component	Construction Activities	Construction Technique	Construction Area	Construction Equipment
Bridge/Culvert Modifications	Headwall raising	1. Existing headwall, wingwall and/or sidewalk demolition (demolition not always necessary)	Destruction and removal of all or part of existing concrete features.	At existing channel roadway crossing.	Backhoe, dump truck, & water truck.
		2. Raise concrete headwall and/or wingwalls	Installation of concrete for new walls or extension of existing walls.	At existing channel roadway crossing.	Flatbed truck, concrete truck, water truck, air hoses & compressor.
	Bridge/culvert reconstruction	1. Demolition of Existing Bridge/Culvert	Excavation, destruction and removal of exiting concrete bridge/culvert structures.	Existing bridge/culverts and immediately surrounding area, as identified on Figures 2-3a through 2-3i.	Excavator, dump truck, front end loader, water truck, air hoses, compressor.
		2. Construction of Replacement Bridge/Culvert	Building of new, slightly larger bridge/culvert at same location as the existing bridge/culvert.	Existing bridge/culverts and immediately surrounding area, as identified on Figures 2-3a through 2-3i. <u>Caribbean Drive</u> : new culvert would extend an additional 8 feet upstream and downstream into the East Channel from the end of the existing bridge	Flatbed boom truck, concrete trucks, front end loader, vibratory roller, water truck, air hoses, compressor.
		3. Concrete wingwalls: Structural installation	Installation of forms, rebar, and reinforcements.	<u>Carl Road</u> : within footprint of existing wingwalls <u>Caribbean Drive</u> : new wingwalls would extend an additional 15 feet upstream and downstream into the East Channel from the end of the new culvert	Flatbed boom truck, concrete trucks, front end loader, vibratory roller, water truck, air hoses & compressor. <i>Crane required only for Caribbean Drive.</i>
		4. Concrete wingwalls: Concrete installation	Concrete is poured and finished, and forms are removed.	Concrete is installed within structural forms (see activity 3 immediately above).	Flatbed boom truck, concrete trucks, front end loader, vibratory roller, water truck, air hoses & compressor. <i>Crane required only for Caribbean Drive.</i>
		5. Restoration of Caribbean Drive with aggregate base rock	Resurfacing of reconstructed bridge/culvert with aggregate base rock.	On the reconstructed portion of bridge/culvert roadway.	Double bottom dump truck, grader, tractor/dozer, front end loader, vibratory roller, water truck.

Project Component	Construction Activities	Construction Technique	Construction Area	Construction Equipment
	6. Restoration of Caribbean Drive with asphalt concrete	Resurfacing of reconstructed bridge/culvert and aggregate base rock layer with asphalt concrete	On the reconstructed portion of bridge/culvert roadway.	Dump trucks, asphalt concrete paver, drum rollers.
	7. Restoration of concrete sidewalk, curb and gutters (only at Caribbean Drive)	Extension of new concrete sidewalk (8 feet), curb and gutters along reconstructed Caribbean Drive bridge.	On larger/new culverts (see activity 3 immediately above).	Flatbed truck, grader, front end loader, vibratory roller, concrete trucks, air hoses, & compressor.
	1. Structural installation for culvert and wingwall extension and headwall raising	Installation of forms, rebar, and reinforcements.	Structural components are extended upstream and downstream from existing West Java roadway crossing and into the West Channel: 10 feet for culvert extension and an additional 15 feet for wingwall extension.	Flatbed boom truck, concrete trucks, front end loader, vibratory roller, water truck, air hoses & compressor
		2. Concrete installation for culvert and wingwall extension and headwall raising	Concrete is poured and finished, and forms are removed.	Concrete is installed within forms (see activity 1 immediately above).
	Demolition of existing sidewalk/gutter and installation of new sidewalk/driveway	Building of new, larger (16-foot) maintenance driveway/sidewalk.	Existing sidewalk and gutter and immediately surrounding areas on the existing roadway.	Flatbed truck, concrete truck, air hoses & compressor.
	Driveway cut and ramp installation	Cut into exiting driveway and installation of concrete for new ramp between roadway and the channel maintenance road.	16 feet at the transition of Bordeaux Drive and the District's existing channel maintenance road. All work would occur on exiting roadways.	Flatbed truck, concrete truck, air hoses & compressor.

Project Component	Construction Activities	Construction Technique	Construction Area	Construction Equipment	
Rock Slope Protection <i>(includes rock on both the channel banks and bed, rock on only the channel bed, and bench construction with rock)</i>	1. Channel excavation	Excavation of sediment and removal of vegetation from the channel. Also, may include removal of existing concrete/rock slope protection from the channel banks.	<u>Typical (without bench):</u> Within the existing channel, from the banks and/or the bed. Excavation would typically occur to a depth of 2.5 feet. <u>Bench Construction:</u> Within the existing channel and from 3.5 to 6 feet outside the top of the existing East Bank <i>(between Awhanee Ave. and East Duane Ave. only)</i>	Excavator, dump trucks, front end loader, tractor/dozer, & water truck.	
	2. Rock installation	Placement of rock in the channel.	Within the excavated channel, on the banks and bed.	Dump trucks, excavators, front end loader, & water truck.	
	3. Erosion control and re-vegetation	Installation of erosion control fabric, hydroseeding and planting, as necessary.	Upper portion of regarded channel banks.	Broadcast sprayer and truck	
Other Modifications	Outfall/wingwall bank stabilization	Installation of concrete on channel	Channel area is prepared by removing any existing rock or sack concrete channel projects. Then, a concrete key is installed and concrete slurry is placed from the existing wingwall along the modified channel area.	<u>Wingwalls:</u> Typically a channel area of 5 feet from the edge of the existing wingwall would be disturbed. <u>Outfalls:</u> Typically 2-feet around the outside edge/diameter of the existing outfall would be disturbed.	Flatbed boom truck, concrete trucks, front end loader, vibratory roller, water truck, air hoses & compressor.
	Low flow notches	Cutting of low flow notch	Concrete is cut and removed from an existing concrete encapsulation.	Small existing concrete encapsulation located in the channel between Iris Avenue and El Camino Real	Excavator, dump trucks, front end loader, tractor/dozer, & water truck.
	Concrete channel lining <i>(only between East Duane Avenue and North Wolfe Road)</i>	1. Removal of existing channel protection structures	Demolition and removal of existing concrete and sack concrete.	Within the existing channel, from the banks and bed.	Excavator, dump trucks, front end loader, tractor/dozer, & water truck.
		2. Channel excavation	Removal of sediment from the channel bed and toe, as necessary to install concrete channel.	Within the existing channel, from the banks and bed.	Front end loader, dump trucks, grader, tractor/dozer, vibratory roller with blade, & water truck.
		3. Lining of existing channel with	Installation of concrete in the channel.	Within the excavated channel, on the banks and bed.	Crane, flatbed boom truck, tractor/dozer, concrete trucks,

Project Component	Construction Activities	Construction Technique	Construction Area	Construction Equipment	
		concrete		grader, front end loader, vibratory roller, air hoses, & compressor.	
	Chain link fence	Vegetation removal and fence installation	Remove vegetation removal then install fence.	Approximately 5-foot area along the proposed fence line along the maintenance road.	Excavator, dump trucks, front end loader, tractor/dozer, & water truck.
	Tree removal	Tree removal	Excavation of and removal of trees.	Generally, the drip line surrounding the tree being removed.	Excavator, dump trucks, front end loader, tractor/dozer, & water truck.

Construction Materials

A variety of different construction materials would be imported to and exported from the Project Site to complete construction activities. Imported materials would include: asphalt concrete, soil/sediment, concrete, Class 3 aggregate base rock, Caltrans light class rock, and possibly sheet piles. Floodwalls would be constructed of either concrete or sheet piles. Export materials would include concrete debris, excavated soil/sediment, and vegetation. Soil/sediment excavated during Project construction is proposed for on-site reuse in the construction of other Project components. Soil excavated for floodwalls from outside the channel banks would only be reused for construction activities on exiting maintenance roads. In addition, some sediment excavated from the channel for rock slope protection would be reused in the channel between rocks installed for rock slope protection. **Table 2-6** provides an overview of Project material import, export, and on-site reuse quantities. For each material, Table 2-6 also identifies Project construction activities associated with the materials use/reuse.

Construction equipment would require use of fuels and petroleum products. Only products commonly associated with construction equipment would be used. Use includes transport of fuels to and from the Project Site and use for construction equipment within the Project Work Area and outside staging areas. No pesticides, herbicides, or any other chemical substances would be used as a part of the Project.

Table 2-6. Project Material Import, Export, and On-site Reuse Quantities

Material	Project Activities	Quantity		
		Sunnyvale East Channel	Sunnyvale West Channel	Project Total
Project Material Imports				
Asphalt concrete	Maintenance road paving for recreational improvements	1,750 yd ³	650 yd ³	2,400d³
Floodwall Construction Materials	Use of lumber, forms, rebar, reinforcement, and construction material for floodwalls	1,700 yd ³	2,000yd ³	3,700 yd³
Concrete ¹	Construction of floodwalls, bridges/culverts, bridge/culvert crossing headwalls, and concrete trapezoidal channel; protection of existing channel wingwalls and outfalls	21,000 yd ³	7,600 yd ³	28,600 yd³
Class 3 aggregate base rock	Surfacing of raising maintenance roads levee surfacing of raised levees and floodwall ramps	8,000 yd ³	2,200 yd ³	10,200 yd³
CalTrans Light-class Rock	RSP construction	48,700 yd ³	16,300 yd ³	65,000 yd³
Sheet piles ¹	Floodwall construction	19,100 lf	19,300 lf	38,400 lf

Project Material Exports				
Concrete debris	Demolition of existing in-channel concrete slope protection hardscape and existing bridge/culvert crossings	2,000 yd ³	100 yd ³	2,100 yd³
Excavated soil/earthen material	RSP and concrete channel lining excavation	48,900 yd ³	16,600 yd ³	65,500 yd³
	Floodwall excavation	3,800 yd ³	1,900 yd ³	5,700 yd³
	Sediment removal (refer to Table 2-3)	535 yd ³	925 yd ³	1,460 yd³
Vegetation	Chain link fence installation; as necessary for other project components	400 yd ³	470 yd ³	870 yd³
Project Material On-site Reuse				
Soil/earthen Material	From floodwall excavation for reuse in constructing floodwalls ramps, floodwalls and maintenance road and levee raising	12,900 yd ³	18,750 yd ³	31,650 yd³

Notes: yd³ = cubic yards; lf = linear feet; RSP = rock slope protection
¹ Floodwalls would be constructed of either concrete or sheet pile.

Staging Areas

Multiple staging areas would be temporarily used during Project construction, for long-term staging of equipment for construction of multiple channel reaches. Different staging areas would be necessary for construction along the East and West Channels. In all, staging areas on 13 separate parcels would be temporarily used for the Project, as identified in Table 2-4 and on Figures 2-3a through 2-3i. No staging would be located in roadways, other than possibly staging on the District’s channel maintenance roads during daily construction hours. Any stockpiling of import, export, or reuse materials would also occur within designated staging areas or channel easements/District right-of-way on District channel maintenance roads.

Transportation Routes

Worker and construction vehicle transportation routes would vary throughout the Project Site, depending on specific activities and locations. While transportation routes to access adjacent reaches may be similar, completely separate routes would be necessary for upstream and downstream areas of the Project Site. The nearest highway—either Hwy 101, SR 237, or I-280—would likely be used to access local roadways in the Project Area. From local roadways, Project reaches would be accessed using the nearest upstream/downstream channel roadway crossing. From channel roadway crossings, the channels would be accessed using existing channel maintenance roads. Transportation between the staging areas and the Project Site would also be necessary in some instances, where some staging areas are not located on or immediately adjacent to the Project Site.

Relocation of Existing Utilities

Existing utilities are located throughout the Project Site, including buried underneath the ground surface, routed along and in roadways, and attached to bridge/culvert crossings of the Sunnyvale Channels. Utilities in the streets are there by franchise agreements with the City. Franchise agreements require the utilities to be relocated at the expense of the utility owner. Also some utilities are on District Property by permit, which also requires removal and relocation at the expense of the utility owner. The following describes utilities that would be relocated during Project construction:

East Channel—Caribbean Drive Reconstruction (Phases I and II):

- Prior to the first year of construction (Phase I), a 12-inch City of Sunnyvale reclaimed water pipeline would be routed through a temporary pipeline, fixed to a steel I-beam, and suspended over the East Channel approximately 20 feet downstream of Caribbean Drive. During Phase II of construction, the pipeline would be permanently relocated to its existing location.
- Prior to Phase I of construction, two 3-inch steel conduits (owner unknown) would be temporarily relocated to the opposite side of the bridge. During Phase II of construction, the conduits would be permanently relocated to their existing location.
- Prior to the second year of construction (Phase II), a 12-inch City of Sunnyvale water pipeline would be permanently relocated to the new bridge section completed during Phase I of construction.
- Prior to Phase II of construction, two 3.5-inch AT&T conduit-cement (C-CEM) lines would be routed through a temporary line, fixed to a steel I-beam, and suspended over the East Channel approximately 20 feet downstream of Caribbean Drive. During Phase II of construction, the lines would be permanently relocated to their existing location.

West Channel—Carl Road Reconstruction:

- Prior to construction, an 8-inch City of Sunnyvale landfill gas pipeline would be routed through a temporary pipeline, fixed to a steel I-beam, and suspended over the West Channel approximately 10 feet upstream of Carl Road. During construction, the pipeline would be permanently relocated to its existing location.
- Prior to construction, two 2-inch City of Sunnyvale condensate collection and return systems lines would be routed through a temporary pipeline, fixed to a steel I-beam, and suspended over the West Channel approximately 10 feet upstream of Carl Road. During construction, the lines would be permanently relocated to their existing location.

2.5.4 Best Management Practices

During Project construction, the District would incorporate a range of BMPs to avoid and minimize undesired effects on the environment. BMPs are generally used by the District for construction projects and have been customized for the Proposed Project, as necessary, to ensure that the intended goal of measure is achieved. BMPs are designed to address anticipated effects of certain work activities on particular types of resources. The BMPs for the project are included at the end of this chapter in **Table 2-8**.

2.6 Permits and Approvals

This EIR would be used by not only the District, but also by agencies issuing permits and other approvals, as well as providing consultations, related to the Proposed Project. Specifically, Project information and environmental analyses contained within the EIR would be used by these agencies for decision making on issues related to their jurisdiction and applicable regulations. **Table 2-7** provides a list of agencies and applicable permits, approvals, and consultations that are expected to be required for the Proposed Project.

Table 2-7. Proposed Project Regulatory Permits, Approvals and Consultations

Agency	Permit / Approval / Consultation	Project Activities
Federal Agencies		
U.S. Army Corps of Engineers	Section 404 Clean Water Act - Permit	Placement of rock in the channel
U.S. Fish and Wildlife Service	Section 7 Federal Endangered Species Act – Section 7 Consultation	Various construction activities
National Marine Fisheries Service/ NOAA Fisheries	Section 7 Federal Endangered Species Act – Section 7 Consultation	Construction within the Sunnyvale Channels
	Magnuson-Stevens Act – Essential Fish Habitat Assessment	Construction within the Sunnyvale Channels
State Agencies		
California Department of Fish and Wildlife	Section 1600 California Fish and Game Code - Streambed Alteration Agreement	Construction within the Sunnyvale Channels
California State Water Resources Control Board	Section 402 Clean Water Act - Stormwater General Construction Permit	Construction related ground disturbances
San Francisco Bay Regional Water Quality Control Board	Section 401 of the Clean Water Act - Water Quality Certification; and Porter-Cologne Water Quality Control Act – Waste Discharge Requirements	Placement of rock in the channel; potential discharge of pollutants during construction activities
San Francisco Bay Conservation and	McAteer-Petris Act – Development Permit	Development of Project components along the south San

Agency	Permit / Approval / Consultation	Project Activities
Development Commission		Francisco Bay Shoreline
California Department of Transportation (CalTrans)	Encroachment Permit	Construction on state highways/within CalTrans right-of-way
Local Agencies		
City of Sunnyvale	Municipal Code Section 13.08.030 – Encroachment Permit	Permanent and temporary acquisition of easements from City of Sunnyvale
	Municipal Code Section 13.16.060 – Tree Removal Permit	Removal of City of Sunnyvale trees during construction
	Municipal Code Section 10.40.080 – Truck Traffic	Temporary traffic controls and lane closures, and equipment haul routes on City of Sunnyvale streets.

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Table 2-8. Best Management Practices for the Proposed Project

BMP Number & Title	Description
Air Quality	
AQ-1 Use Basic Dust Control Measures For All Construction Sites	Implement Bay Area Air Quality Management District (BAAQMD) Basic Control Measures for construction emissions of PM ₁₀ at all construction sites. Current measures stipulated by the BAAQMD CEQA Guidelines include the following (BAAQMD 2010): <ol style="list-style-type: none"> 1. Active areas shall be watered at least twice per day unless soils are already sufficiently moist to avoid dust. The amount of water must be controlled so that runoff from the site does not occur, yet dust control is achieved. 2. Trucks hauling soil, sand, and other loose materials shall be covered or shall maintain at least two feet of freeboard. 3. Unpaved access roads, parking areas and staging areas at construction sites shall be paved, watered three times daily, or non-toxic soil stabilizers shall be applied to control dust generation. 4. Paved site access roads, parking areas, and staging areas shall be swept daily (with vacuum-powered street sweepers). 5. Paved public streets shall be swept (with vacuum-powered street sweepers) if visible soil material is carried onto adjacent paved surfaces.
AQ-2 Use Enhanced Dust Control Measures For Sites Greater Than Four Acres in Size	Implement Bay Area Air Quality Management District Enhanced Dust Control Measures. Current measures stipulated by the BAAQMD CEQA Guidelines include the following (BAAQMD 2010): <ol style="list-style-type: none"> 1. All BAAQMD “Basic” control measures (identified in BMP AQ-1). 2. Inactive areas (previously graded areas inactive for ten days or more) shall be sprayed with soil stabilizer or seeded. 3. Exposed stockpiles (dirt, sand, etc.) shall be watered twice daily, enclosed, covered, or sprayed with soil stabilizers. 4. Traffic speeds on unpaved roads shall be limited to 15 mph. 5. Sandbags or other bank protections shall be installed to prevent silt runoff to roadways. 6. Vegetation in disturbed areas shall be replanted as soon as horticulturally appropriate. For example, plant material may not be ready as soon as the job is done (e.g. willow cuttings have to be collected during winter dormancy).

BMP Number & Title	Description
AQ-3 Incorporate Additional Dust Control Measure, As Appropriate	<p>Implement appropriate Bay Area Air Quality Management District (BAAQMD) Optional Control Measures for construction emissions of PM₁₀ at all construction sites. BAAQMD Optional Control Measures are strongly encouraged at construction sites that are large in area, located near sensitive receptors, or which for any other reason may warrant additional emissions reductions. Current measures stipulated by the BAAQMD CEQA Guidelines include the following (BAAQMD 2010):</p> <ol style="list-style-type: none"> 1. Install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site. 2. Install wind breaks or plant trees/vegetation wind breaks at windward side(s) of construction areas. 3. Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph. 4. Limit the area subject to excavation, grading, and other construction activity at any one time. 5. Tailgates of trucks shall be sealed. 6. Trucks shall be brushed down before leaving the site.
AQ-4 Avoid Stockpiling Potentially Odorous Materials near Residences	<p>Some sites will have materials that are rich in organic matter decaying in an anaerobic condition, which generates assorted malodorous gases, such as reduced sulfur compounds. These materials will be handled in a manner that avoids impacting sensitive residential receptors.</p> <ol style="list-style-type: none"> 1. Avoid stockpiling potentially odorous materials within 1,000 feet of residential areas. 2. Where appropriate, odorous stockpiles will be disposed of at an appropriate landfill.
<p>Biological Resources</p> <p><i>The BMPs for biological resources are designed to minimize impacts to sensitive resources, including special status and listed species, and sensitive natural communities and habitats. Sensitive species and habitats may be directly or indirectly affected by Project activities such as excavation, fill, vegetation management including pruning or removal, alteration of hydrological regime, etc. Impacts to species and natural communities are regulated by agencies such as the California Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, and the San Francisco Bay Conservation and Development Commission; and corresponding laws such as the State and Federal Endangered Species Acts, the Migratory Bird Treaty Act, the Clean Water Act, the Fish and Game Code, the Native Plant Protection Act, and the California Environmental Quality Act. In addition, the California Native Plant Society publishes a rarity listing status for plants that is used by the California Department of Fish and Wildlife and is required for review under CEQA.</i></p>	
BIO-1 Avoid Relocating Mitten Crabs	<p>Sediment potentially containing Chinese Mitten Crabs will not be transported between San Francisco Bay Watersheds and Monterey Bay Watersheds, specifically:</p> <ol style="list-style-type: none"> 1. Sediment removed from creeks in the San Francisco Bay watersheds (Lower Peninsula/West Valley, Guadalupe, Coyote) will not be transported into the Monterey Bay Watershed (Pajaro); 2. Sediment removed from the San Francisco Bay watersheds will not be transported south of Metcalf Road in

BMP Number & Title	Description
	<p>Coyote Valley, or south of the entrance to Calero County Park on McKean Road; and, Earth moving equipment used in the San Francisco Bay watershed will be cleaned before being moved to and used in the Pajaro Watershed.</p>
<p>BIO-2 Avoid and Minimize Impacts on Native Aquatic Vertebrates</p>	<p>Native aquatic vertebrates (fish, amphibians and reptiles) are important components of stream ecosystems. Native aquatic vertebrates may or may not be able to rapidly re-colonize a stream reach if the population is eliminated from that stream reach. If native aquatic vertebrates are present when cofferdams, water bypass structures, and silt barriers are to be installed, an evaluation of the stream and the native aquatic vertebrates will be conducted by a qualified biologist. The qualified biologist will consider :</p> <ol style="list-style-type: none"> 1. Which native aquatic species are present; 2. The ability of the species to naturally re-colonize the stream reach; 3. The life stages of the native aquatic vertebrates present; 4. The flow, depth, topography, substrate, chemistry and temperature of the stream reach; 5. The feasibility of relocating the aquatic species present; and 6. The likelihood the stream reach will naturally dry up during the work season. <p>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 District's Fish Relocation Guidelines.</p>
<p>BIO-3 Minimize Impacts to Steelhead</p>	<p>Steelhead migrate upstream during the winter months to lay eggs. Eggs remain in the gravels for several weeks. Fry emerge from the gravel and may spend up to a year in local streams before migrating to the ocean. To avoid and minimize impacts to salmonids, routine use of vehicles and equipment in live salmonid streams will be avoided between January 1 and June 15.</p>

BMP Number & Title	Description
BIO-4 Minimize Access Impacts	<p>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 impacts:</p> <ol style="list-style-type: none"> 1. Temporary 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 impacts. 2. Any temporary fill used for access will be removed upon completion of the project. Site topography and geometry will be restored to pre-project conditions to the extent possible. 3. Off-road vehicular access routes will be surveyed and flagged by a qualified biologist prior to use to avoid sensitive plants, animal burrows, wetlands and vernal pools, or other sensitive habitat. Whenever possible, routes should be not more than 15 feet wide. Personnel and vehicles are required to stay within marked access areas.
BIO-5 Remove Temporary Fills as Appropriate	<p>Temporary fills, such as for diversion structures or cofferdams, will be removed upon finishing the work. The creek channels and banks will be re-contoured to match pre-construction conditions to the extent possible.</p>
BIO-8 Avoid Impacts to Nesting Migratory Birds	<p>Nesting birds are protected by state and federal laws. The District will protect nesting birds and their nests from abandonment, loss, damage or destruction.</p> <p>Nesting bird surveys will be performed by a qualified individual prior to any activity that could result in the abandonment, loss, damage or destruction of birds, bird nests, or nestling migratory birds. Inactive bird nests may be removed, with the exception of raptor nests.</p> <p>No birds, nests with eggs, or nests with hatchlings will be disturbed.</p>
BIO-9 Use Exclusion Devices to Prevent Migratory Bird Nesting	<p>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.</p>

BMP Number & Title	Description
<p>BIO-10 Minimize Impacts to Vegetation Whenever Clearing (or Trimming) is Necessary</p>	<p>Vegetation to be trimmed or cleared will be evaluated by a qualified vegetation specialist or qualified biologist prior to impacts and the qualified vegetation specialist or qualified biologist recommendations will be followed.</p> <p>Survey cross-sections will be moved, within acceptable tolerances, to avoid cutting dense riparian vegetation and minimize cutting of woody vegetation, taking advantage of natural breaks in foliage. If the cross-section cannot be moved within the established acceptable tolerances to avoid impacts to dense riparian or woody vegetation, the cross-section will be abandoned.</p> <p>Cutting vegetation will be limited to the minimum length, width, and height necessary for safely accessing survey locations, and completing the cross-section surveys. Tree pruning will conform to International Society of Arboriculture (ISA) pruning standards. No trees with a 6-inch or greater diameter at breast height will be removed; and, no branches greater than 4" diameter will be removed.</p> <p>Woody vegetation (i.e. native trees and shrubs) which require pruning for equipment access, construction operations, etc, shall be pruned correctly such that health status is maintained and no post-construction impacts accrue.</p> <p>Woody material (including live leaning trees, dead trees, tree trunks, large limbs, and stumps) will be retained on site, unless it is threatening a structure or impedes access, in which case it must be moved to a less threatening position.</p>
<p>BIO-11 Minimize Root Impacts to Woody Vegetation</p>	<p>Construction activities, including cut and fill, will be minimized to the extent practicable within the root zones of existing woody vegetation to remain post project. In general, root extent can be estimated as 2-3 times canopy radius, but vary depending on slope and soil conditions. To the extent practicable, construction setbacks will be calculated using all of the following:</p> <ol style="list-style-type: none"> 1. Tree DBH (diameter at breast height); and 2. Age class and sensitivity to disturbance (species dependent). <p>Additionally, mulching the root zone will be employed to provide root protection from unavoidable equipment traffic during construction, specifically:</p> <ol style="list-style-type: none"> 1. Use 6 inches minimum depth of wood chips; or, 2. 4 inches minimum depth of ¾-inch (or greater) gravel. <p>Both may remain in place after work if approved by a qualified biologist or vegetation specialist.</p>

BMP Number & Title	Description
BIO-13 Plant Local Ecotypes Of Native Plants and Choose Appropriate Erosion-Control Seed Mixes	<p>Whenever native species are prescribed for installation on District fee properties or easements, the following steps will be taken by a qualified biologist or vegetation specialist:</p> <ol style="list-style-type: none"> 1. Evaluate whether the plant species currently grows wild in Santa Clara County; and, 2. If so, the qualified biologist or vegetation specialist will determine if any need to be local natives, i.e. grown from propagules collected in the same or adjacent watershed, and as close to the project site as feasible. <p>Also, consult a qualified biologist or vegetation specialist to determine which seeding option is ecologically appropriate and effective, specifically:</p> <ol style="list-style-type: none"> 1. For areas that are disturbed, an erosion control seed mix may be used. 2. 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. 3. Temporary earthen access roads may be seeded when site and horticultural conditions are suitable. 4. 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. <p>Seed selection shall be ecologically appropriate as determined by a qualified biologist.</p>
BIO-14 Maintain Low-Flow Fish Passage	<p>If a non-tidal stream channel has been altered during instream operations/maintenance, its low-flow channel shall be returned, as nearly as possible, to its approximate, prior location. The low-flow channel shall have the appropriate depth/width for fish passage and sediment transport without creating a possible, future bank erosion problem.</p>
BIO-15 Restore Riffle/Pool Configuration of Channel Bottom	<p>The District shall re-grade the channel bottom at the end of the work project to as close to original conditions as possible.</p> <p>In salmonid streams, restore pool and riffle configurations to emulate pre-project instream conditions, taking into account channel morphological features (i.e. slope), which affects riffle/pool sequence.</p>

BMP Number & Title	Description
BIO-16 Avoid Animal Entry and Entrapment	<p>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.</p> <p>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.</p> <p>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:</p> <ol style="list-style-type: none"> 1. Hole to 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; or 2. 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; or <p>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.</p>
BIO-17 Minimize Predator-Attraction Effects on Wildlife	Remove trash daily from the worksite to avoid attracting potential predators to the site.
Cultural Resources	
CU-2 Stop Work and Report Archaeological Finds	<p>Work in areas where archaeological artifacts are found will be restricted or stopped until proper protocols are met. Work at the location of the find will halt immediately within 30 feet of the find. A Consulting Archaeologist will visit the discovery site as soon as practicable for identification and evaluation pursuant to Section 21083.2 of the Public Resources Code and Section 15126.4 of the California Code of Regulations. If the archaeologist determines that the artifact is not significant, construction may resume. If the archaeologist determines that the artifact is significant, the archaeologist will determine if the artifact can be avoided and, if so, will detail avoidance procedures. If the artifact cannot be avoided, the archaeologist will develop within 48 hours an Action Plan which will include provisions to minimize impacts and, if required, a Data Recovery Plan for recovery of artifacts in accordance with Public Resources Code Section 21083.2 and Section 15126.4 of the CEQA Guidelines.</p>

BMP Number & Title	Description
CU-3 Stop Work and Report Burial Finds	Work in areas where any burial site is found will be restricted or stopped until proper protocols are met. Upon discovering any burial site as evidenced by human skeletal remains, the County Coroner will be immediately notified. No further excavation or disturbance within 30 feet of the site or any nearby area reasonably suspected to overlie adjacent remains may be made except as authorized by the County Coroner, California Native American Heritage Commission, and/or the County Coordinator of Indian Affairs.
Hazards and Hazardous Materials	
HM-9 Clean Vehicles and Equipment	Vehicles will be washed only at the approved area in the corporation yard. No washing of vehicles will occur at job sites.
HM-10 Assure Proper Vehicle and Equipment Fueling	<p>No fueling will be done in a waterway or immediate flood plain, unless equipment stationed in these locations is not readily relocated (i.e., pumps, generators).</p> <ol style="list-style-type: none"> 1. For stationary equipment that must be fueled on-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. 2. Any equipment that is readily moved out of the waterway will not be fueled in the waterway or immediate flood plain. <p>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.</p>
HM-11 Assure Proper Vehicle and Equipment Maintenance	<p>No equipment servicing will be done in a stream channel or immediate flood plain, unless equipment stationed in these locations cannot be readily relocated (i.e., pumps, generators).</p> <ol style="list-style-type: none"> 1. Any equipment that can be readily moved out of the channel will not be serviced in the channel or immediate flood plain. 2. 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. 3. 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 flood plain. <p>If emergency repairs are required, containment will be provided equivalent to that done for fueling or servicing.</p>

BMP Number & Title		Description
HM-12	Assure Proper Hazardous Materials Management	<p>Measures will be implemented to ensure that hazardous materials are properly handled and the quality of water resources is protected by all reasonable means.</p> <ol style="list-style-type: none"> 1. Prior to entering the work site, all field personnel will know how to respond when toxic materials are discovered. 2. The discharge of any hazardous or non-hazardous 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. <p>In the event of any hazardous material emergencies or spills, personnel will call the Chemical Emergencies/Spills Hotline at 1-800-510-5151.</p>
HM-13	Prevent Spills	<p>Prevent the accidental release of chemicals, fuels, lubricants, and non-storm drainage water.</p> <ol style="list-style-type: none"> 1. Field personnel will be appropriately trained in spill prevention, hazardous material control, and clean-up of accidental spills. <p>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.</p>
HM-14	Know the Spill Kit Location	<p>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).</p> <ol style="list-style-type: none"> 1. Prior to entering the work site, all field personnel will know the location of spill kits on crew trucks and at other locations within District facilities. <p>All field personnel will be advised of these locations and trained in their appropriate use.</p>
HM-15	Avoid Exposing Soils with High Mercury Levels	<p>To ensure worker safety is protected in areas with elevated mercury concentrations in exposed surfaces, personal protective equipment will be required during project construction to maintain exposure below levels established by the California Division of Occupational Safety and Health (Cal/OSHA).</p>
Hydrology/Water Quality		
WQ-1	Conduct Work from Top of Bank	<p>For minor work activities that will occur in the channel, work will be conducted from the top of the bank if access is available and there are flows in the channel.</p>

BMP Number & Title	Description
<p>WQ-2 Evaluate Use of Wheel and Track Mounted Vehicles in Stream Bottoms</p>	<p>Field personnel will use the appropriate equipment for the job that minimizes disturbance to the stream bottom. Appropriately tired vehicles, either tracked or wheeled, will be used depending on the situation. Tracked vehicles (bulldozers, loaders) may cause scarification. Wheeled vehicles may cause compaction. Heavy equipment will not operate in the live stream.</p>
<p>WQ-3 Assess Pump/Generator or Set Operations and Maintenance</p>	<p>Pumps and generators will be maintained and operated in a manner that minimizes impacts to water quality and aquatic species.</p> <ol style="list-style-type: none"> 1. Pumps and generators will be maintained according to manufacturers' specifications to regulate flows to prevent dry-back or washout conditions. 2. Pumps will be operated and monitored to prevent low water conditions, which could pump muddy bottom water, or high water conditions, which creates ponding. 3. Pump intakes will be screened to prevent uptake of fish and other vertebrates. <p>Sufficient back-up pumps and generators will be onsite to replace defective or damaged pumps and generators.</p>
<p>WQ-4 Handle Sediments so as to Minimize Water Quality Impacts</p>	<p>Sediments will be stored and transported in a manner that minimizes water quality impacts.</p> <ol style="list-style-type: none"> 1. 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. 2. This measure applies to saturated, not damp, sediments and depends upon the availability of a stockpile site. 3. 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 the RWQCB are implemented. 4. Trucks may be lined with an impervious material (e.g. plastic), or the tail gate 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. 5. Water will not drain directly into channels (outside of the work area) or onto public streets without providing water quality control measures. <p>Streets 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.</p>

BMP Number & Title	Description
WQ-5 Avoid Runoff from Soil Stockpiles	If soil is to be stockpiled, no run-off will be allowed to flow to a surface water bodies. Placement of straw wattle, earthen berms or other low-profile barriers will be used as necessary to ensure runoff of soil cannot reach surface water bodies. If earthen berms are used, the faces will be covered by a protected covering (e.g., plastic or fabric) if needed to minimize erosion. Alternatively, the stockpiled material could directly be covered by a protective covering and weighted down.
WQ-6 Stabilize Construction Entrances and Exits	Measures will be implemented to minimize soil from being tracked onto streets near work sites: <ol style="list-style-type: none"> 1. Methods used to prevent mud from being tracked out of work sites onto roadways include installing a layer of geotextile mat, followed by a 4-inch thick layer of 1 to 3-inch diameter gravel on unsurfaced access roads. Access will be provided as close to the work area as possible, using existing ramps where available and planning work site access so as to minimize disturbance to the water body bed and banks, and the surrounding land uses.
WQ-10 Evaluate and Select the Most Appropriate Use of Concrete Near Waterways	Concrete that has not been cured is alkaline and can increase the pH of the water; fresh concrete will be isolated until it no longer poses a threat to water quality using the following appropriate measures: <ol style="list-style-type: none"> 1. Wet sacked concrete will be excluded from the wetted channel for a period of two weeks after installation. During that time, the wet sacked concrete will be kept moist (such as covering with wet carpet) and runoff from the wet sacked concrete will not be allowed to enter a live stream. 2. Poured concrete will be excluded from the wetted channel for a period of two weeks after it is poured. During that time, the poured concrete will be kept moist, and runoff from the wet concrete will not be allowed to enter a live stream. Commercial sealants (e.g., Deep Seal, Elasto-Deck Reservoir Grade) may be applied to the poured concrete surface where difficulty in excluding water flow for a long period may occur. If a sealant is used, water will be excluded from the site until the sealant is dry. 3. Dry sacked concrete will not be used in any channel. An area outside of the channel and floodplain will be designated to clean out concrete transit vehicles.
WQ-11 Use Cofferdams 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 impacts are minimized. Installation of coffer dams will begin at low tide. Cofferdams in tidal areas may be made from earthen material. If earth is used, the downstream and upstream faces will be covered by a protected covering (e.g., plastic or fabric) if needed to minimize erosion.

BMP Number & Title	Description
WQ-12 Divert/ Bypass Water at Non-tidal Sites	<p>When work is necessary in the Sunnyvale Channels, the entire streamflow will be diverted around the work area by a barrier. Construction of the barrier will normally begin in the upstream area and continue in a downstream direction, and the flow will be diverted only when construction of the diversion is completed. The water diversion plan will allow stream flows to gravity flow around or through the work site using temporary culverts or stream flow is pumped around the work site using pumps and screened intake hoses. Cofferdam construction will be adequate to prevent seepage into or from the work area. Cofferdams will be constructed of river run gravel with a fines content that is less than 15%. Fines are defined as material that is able to pass through a #20 sieve. Cofferdams may also be constructed of sheet piles, inflatable dams, or sand bags. Cofferdams will be installed both upstream and downstream not more than 100 feet from the extent of the work areas.</p> <p>In-channel berms that only deflect water to one side of the channel during sediment removal may be constructed of channel material. The enclosure and the supportive material will be removed when the work is completed and the removal will normally proceed from downstream in an upstream direction.</p> <p>Normal flows will be restored to the affected stream immediately upon completion of work at that location:</p> <ol style="list-style-type: none"> 1. All water will be discharged in a non-erosive manner (e.g., gravel or vegetated bars, on hay bales, on plastic, on concrete, or in storm drains when equipped with filtering devices, etc.). 2. Sumps or basins may also be used to collect water, where appropriate (e.g., in channels with low flows). 3. Where feasible and appropriate, diversion structures will be installed on concrete sections of the channels or constructed of materials specified above. Earth fill will not be used for cofferdams in non-tidal areas. 4. In conjunction with diversion structures, pumps or gravity-fed pipe systems will be used to dewater sites. 5. Depending on the channel configurations, sediment removal may occur where the flows are not bypassed around the work site; as long as during excavation activities, a berm of sediment is left between the work area and stream flows to minimize water quality impacts. <p>Diversions will maintain ambient stream flows below the diversion, and waters discharged below the project site will not be diminished or degraded by the diversion.</p>
WQ-15 Manage Groundwater at Work Sites	<p>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.</p>

BMP Number & Title	Description
WQ-16 Avoid Erosion When Restoring Flows	<p>All temporary diversion structures and the supportive material will be removed no longer than 48 hours after work is completed. The removal will normally proceed from downstream in an upstream direction. Normal flows will be restored to the affected stream immediately upon completion of work at that location. Flows will be restored in a manner that minimizes erosion.</p> <ol style="list-style-type: none"> 1. When diversion structures are removed, to the extent practicable, the ponded flows will be directed into the low-flow channel within the work site to minimize downstream water quality impacts. 2. Flows will gradually be restored to the channel to avoid a surge of water that would cause erosion or scouring. <p>Bypassed flows may be slowly reintroduced into the dewatered area by leaving a silt barrier in place to allow water to slow and drop sediment to the extent possible.</p>
WQ-18 Maintain Clean Conditions at Work Sites	<p>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.</p> <p>Upon completion of work, all building materials, debris, unused materials, concrete forms, and other construction-related materials will be removed from the work site.</p>
WQ-19 Control Emergency Discharges	<p>To control emergency discharges of treated water, recycled water, raw water, and groundwater should they occur (emergency discharges are discharges that are performed in an emergency due to public health concerns related to water quality or the result of an area-wide natural disaster):</p> <ol style="list-style-type: none"> 1. Inspect the flow path of the discharged water. 2. Identify areas with erosion potential that may require repair or protection during subsequent repairs or corrective actions. 3. Identify and remove pollutants that could be discharged into a storm drain or receiving water. 4. Implement the appropriate control measures. 5. Inspection and Maintenance: <ol style="list-style-type: none"> a. Monitor the discharge to ensure the control measure is effective. b. Monitor the discharge to make sure it is not causing flooding. c. When the discharge is complete, remove sediment deposited in the flow path and dispose of appropriately. d. Remove control measures when discharge is complete. e. If the discharge was to a receiving water body, inspect the receiving water for impacts.

BMP Number & Title	Description
<p>WQ-20 Control Unplanned Discharges</p>	<p>To control unplanned discharges of treated water, recycled water, raw water, and groundwater systems operation and maintenance activities:</p> <ol style="list-style-type: none"> 1. Inspect the flow path of the discharged water. 2. Identify areas with erosion potential that may require repair or protection during subsequent repairs or corrective actions. 3. Identify and remove pollutants that could be discharged into a storm drain or receiving water. 4. If repairs or corrective actions will cause additional discharges of water, select appropriate control measures. 5. Inspection and Maintenance: <ol style="list-style-type: none"> a. Monitor the discharge to ensure the control measure is effective. b. Sweep up sediment deposited in the flow path and dispose of appropriately. c. Make repairs to eroded areas as necessary to prevent further erosion.
<p>WQ-21 Control Sediment/ Turbidity for Discharges Less than 50 NTU</p>	<p>To control sediment and turbidity in discharges from project activities where the source is treated water, recycled water, raw water, or groundwater with a turbidity of less than 50 NTU:</p> <ol style="list-style-type: none"> 1. Characterize the discharge appropriately: <ol style="list-style-type: none"> a. Identify the source of water. b. Determine the volume of the water to be discharged. c. Determine if operations may cause the turbidity to be greater than 50 NTU, refer to BMP WQ-22. 2. Choose the option for discharging the water (in order of preference): <ol style="list-style-type: none"> a. Reuse water, either for dust suppression, irrigation, or construction compaction. b. Discharge to sanitary sewer system (requires approval from local sanitary district). c. Discharge to storm drain system or water body. 3. Use appropriate control measures when discharging water: <ol style="list-style-type: none"> a. Use sanitary sewer BMPs if discharging to the sanitary sewer. b. Visually monitor the turbidity if it is suspected to be above 50 NTU. c. Terminate the discharge or implement appropriate control measures if the turbidity exceeds 50 NTU (refer to BMP WQ-22). d. There are no additional control measures required if the source water is hydrant flushing, fire flow testing, a main line break or blow off, and the discharge volume is not greater than 50,000 gallons. 4. Inspection and Maintenance:

BMP Number & Title	Description
	<ul style="list-style-type: none"> a. Before discharging any water, inspect the discharge flow path for debris and erosion, and cleanup the flow path as needed. b. Monitor the discharge to make sure it is not interfering with the normal operation of the sanitary sewer, or flooding the storm drain system. c. When the discharge is complete, inspect the flow path and receiving water (if discharging directly to a water body, if practicable) for evidence of erosion or deposited sediment. d. Sweep up sediment deposited in the flow path and dispose of appropriately.
<p>WQ-22 Control Sediment/ Turbidity for Discharge Greater than 50 NTU</p>	<p>To control sediment and turbidity in discharges from project activities where the source is treated water, recycled water, raw water, or groundwater with a turbidity of greater than 50 NTU:</p> <ul style="list-style-type: none"> 1. Characterize the discharge appropriately: <ul style="list-style-type: none"> a. Identify the source of water. b. Determine the volume of water to be discharged. c. Determine the turbidity of the discharge. 2. Choose the option for discharging the water (in order of preference): <ul style="list-style-type: none"> a. Reuse water, either for dust suppression, irrigation, or construction compaction. b. Discharge to sanitary sewer system (requires approval from local sanitary district). c. Discharge to storm drain system or water body (requires use of sediment/ turbidity control measures). 3. Select control measures appropriately. <p>Consider the following criteria when selecting the appropriate control measure:</p> <ul style="list-style-type: none"> a. Suitability of area for discharge (vegetated surface, chlorine neutralization requirements). b. Proximity to storm drains or receiving waters. c. Length of time BMP is to be in place. d. Ease of installation, operation and removal. <p>Use the California Stormwater Quality Association (CASQA) Construction BMP Handbook (available: http://www.cabmphandbooks.com/) for selection and implementation of the appropriate control measures, such as:</p> <ul style="list-style-type: none"> a. Discharges to Sanitary Sewer Systems. b. Flow Path – Vegetation Filtration. c. Flow Path – Check Filters.

BMP Number & Title	Description
	<ul style="list-style-type: none"> d. On-Line Filter System. e. Storm Drain Inlet Protection. f. Silt Fence Culvert Entrance Protection. g. Surface Protection – Armoring. h. Surface Protection – Flow Diversion. <p>4. Inspection and Maintenance:</p> <ul style="list-style-type: none"> a. Before discharging any water, inspect the discharge flow path for debris and erosion, and cleanup the flow path as needed. b. Monitor the discharge to make sure it is not interfering with the normal operation of the sanitary sewer, or flooding the storm drain system. c. Monitor the discharge turbidity to evaluate the effectiveness of the control measure. d. When the discharge is complete, inspect the flow path and receiving water (if discharging directly to a water body, if practicable) for evidence of erosion or deposited sediment. e. Sweep up sediment deposited in the flow path and dispose of appropriately.
<p>WQ-24 Evaluate Use of Discharge Flow Path – Check Filters</p>	<p>To remove sediment from discharges with a turbidity more than 50 NTU, place check filters at single or multiple location along the flow path accordingly:</p> <ul style="list-style-type: none"> 1. Design Check Filters Properly: <ul style="list-style-type: none"> a. Consider the slope, erosion potential, and flow rate of the discharge when choosing filter materials and locating filters. b. Avoid creating large pools and/or obstructive flow paths. 2. Construct Check Filters Correctly: <ul style="list-style-type: none"> a. Place sandbags, socks filled with sand or gravel, and/or dikes made of filter fabric and gravel perpendicular to the flow path. b. Line the sandbags, socks, and dikes tight to divert the flow at least 2 feet outside its normal path. c. Construct an overflow (low spot) in the check filter. If the flow rate of the discharge is high and considerable amounts of sediment appear to be passing by the filter, construct a series of two or more filters until effective removal of sediment is achieved. 3. Inspection and Maintenance: <ul style="list-style-type: none"> a. Monitor the discharge for breakthrough of sediments and potential traffic hazards caused by ponded water.

BMP Number & Title	Description
	<ul style="list-style-type: none"> b. Add more check dams and implement traffic control as necessary. c. After the discharge is finished, sweep up sediment deposited behind check filters and dispose of properly.
<p>WQ-25 Evaluate Use of Discharge On-Line Filter Systems</p>	<p>To remove sediments and impurities from discharges with a turbidity that exceeds approximately 50 NTU:</p> <ol style="list-style-type: none"> 1. Select and Use On-Line Filter Systems Appropriately: <ol style="list-style-type: none"> a. Use when the discharge is planned and filter assembly can be fitted to the discharge point either permanently or prior to each discharge. b. Choose an on-line filter system capable of removing fine and medium size particulate matter and sediments at the desired discharge flow rate and duration. c. Follow the instructions for use provided by the designer or manufacturer. 2. Inspection and Maintenance: <ol style="list-style-type: none"> a. Inspect the filter during the discharge for clogging and deterioration, and breakthrough of sediment. Replace the filter as necessary. b. After the discharge is finished, sweep up sediment deposited in the flow path and dispose of the sediment properly. c. Dispose of the filter and sediment captured by the filter properly.
<p>WQ-27 Evaluate Use of Discharge Surface Protection - Armoring</p>	<p>To protect exposed soil and vegetated surfaces from erosion during discharges by placing protective armor (e.g. plastic sheeting, cloth fabric, gravel bedding) over the erodible surface:</p> <ol style="list-style-type: none"> 1. Select and install armoring materials properly: <ol style="list-style-type: none"> a. Choose a material whose strength is proportionate to the velocities and materials in the discharged water (e.g. sediment). b. Clear the area to be protected of rocks and debris which may puncture the armor. c. Anchor the armor using sandbags, gravel, or stakes along the perimeter. d. Anchor the armor so it can withstand movement of the discharge. e. Account for potential changes in the flow direction of the discharge when laying the armor. f. If there is to be a direct stream of high velocity flow, an energy dissipating device may be necessary to prevent failure of the armor. 2. Inspection and Maintenance: <ol style="list-style-type: none"> a. During the discharge, monitor the armor for failure (tearing) and erosion at the edges of the armor. b. If erosion does occur, implement sediment/turbidity control measures.

BMP Number & Title	Description
	<ul style="list-style-type: none"> c. Remove armor when the discharge is complete. d. Sweep up any sediment deposited in the flow path and dispose of appropriately.
<p>WQ-28 Evaluate Use of Discharge Surface Protection – Flow Diversion</p>	<p>To protect bare soil and vegetated surfaces from erosion by diverting, channeling, or temporarily piping flows over erodible areas to protected areas not subject to erosion:</p> <ol style="list-style-type: none"> 1. When considering the use of flow diversion, take into account the following: <ol style="list-style-type: none"> a. There must be a storm drain or paved surface nearby to which the discharge can be diverted. b. The flow channel must be aligned to avoid disruption of traffic, or traffic control measures must be used. c. The flow channel must have sufficient slope to allow the discharge to flow to the storm drain or paved surface. d. The flow channel must be designed to handle the anticipated flow rate. e. Protective armor or temporary piping can be used for high velocity discharges or large flow volume discharges over bare soils or vegetated surfaces. The armor material selected must be able to withstand the flow velocity and movement of the discharge. 2. Divert flows correctly: <ol style="list-style-type: none"> a. Divert water to a channel using fixed or flexible piping, or another system to capture this flow (e.g. sand bags). b. If armor is used to create a flow channel over the erodible surface clear the area to be protected of rocks and debris which may puncture the armor. c. Anchor the armor using sandbags, gravel, or stakes along the perimeter. d. If there is to be a direct stream of high velocity flow, an energy dissipating device may be necessary to prevent failure of the armor. 3. Inspection and Maintenance: <ol style="list-style-type: none"> a. Inspect the area for flooding resulting from failure of the channel diversion structure or the flow rate exceeding the diversion channel capacity. b. Inspect the channel for erosion along the edges due to overtopping of the channel. c. Monitor the armor for failure (tearing) and erosion at the edges of the armor. d. If erosion does occur along the edges of the channel or armor, implement sediment/turbidity control measures. e. Remove armor when the discharge is complete.

BMP Number & Title	Description
WQ-29 Evaluate Use of Discharge Storm Drain Curb & Drop Inlet Protection	<p>f. Sweep up any sediment deposited in the flow path and dispose of appropriately.</p> <p>To install temporary devices around drain inlets using gravel, wire mesh, and /or concrete blocks that may prevent sediment-laden runoff from entering the storm drain system or watercourses (These devices reduce the velocity of runoff, allowing sediments to settle. The gravel can also filter out coarse sediment from runoff.):</p> <ol style="list-style-type: none"> <li>1. Use drain inlet protection in appropriate locations: <ol style="list-style-type: none"> <li>a. Use in drainage areas less than one acre. <li>b. Place anywhere sediment-laden runoff could discharge into a storm drain inlet. <li>c. If the inlet protection device could pond water, install only where ponded water will not contact materials, flood structures, or cause a nuisance. <li>d. Completely cover inlet where work activities could result in vegetation, raw materials or sediment being deposited into the inlet, or when a small spill occurs near the inlet. Cover inlets with rubber or polyurethane mats, or plastic sheeting anchored with gravel bags. <li>2. Install inlet protection properly: <ol style="list-style-type: none"> <li>a. To prevent seepage of sediment-laden runoff into the drain inlet, install drain inlet protection so there are no gaps around the drain inlet. <li>b. Do not place filter fabric over the inlet grate as it can become clogged with sediment and contribute to flooding. <li>3. Gravel and Wire Mesh Drop Inlet Protection: <ol style="list-style-type: none"> <li>a. Place wire mesh over the inlet so the wire extends a minimum of 12 inches beyond each side of the inlet structure. Use hardware cloth or comparable wire mesh with ½-inch openings. If more than one mesh strip is required, overlap the strips. <li>b. Pile ¾ to 3-inch washed gravel on top of the mesh surrounding the inlet to a minimum depth of 12 inches. Extend the gravel at least 18 inches beyond the inlet on all sides. <li>4. Gravel and Wire Mesh Curb Inlet Protection: <ol style="list-style-type: none"> <li>a. Place wire mesh over the inlet so the wire extends a minimum of 12 inches beyond each side of the inlet structure. Use hardware cloth or comparable wire mesh with ½-inch openings. <li>b. Pile ¾ to 3-inch washed gravel against the mesh to anchor it against the gutter and inlet cover and to surround the inlet completely. <li>5. Block and Gravel Curb Inlet Protection: <ol style="list-style-type: none"> <li>a. Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are the

BMP Number & Title	Description
	<p>space blocks.</p> <ul style="list-style-type: none"> b. Place a 2-inch by 4-inch stud through the outer holes of each spacer block to align the front blocks. c. Place more concrete blocks on their sides across the front of the inlet and abutting the spacer blocks. Do not use mortar. d. Place wire mesh with ½-inch openings over the outside vertical face of the blocks to keep gravel out of the inlet. e. Place ¾ to 3-inch washed gravel against the wire mesh to the top of the blocks, on slopes of 2:1 or flatter.
6.	<p>Block and Gravel Drop Inlet Protection:</p> <ul style="list-style-type: none"> a. Place wire mesh over the inlet so the wire extends a minimum of 12 inches beyond each side of the inlet structure. Use hardware cloth or comparable wire mesh with ½-inch openings. If more than one mesh strip is required, overlap the strips. b. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so the open end face outward not upward. Abut the ends of the adjacent blocks. c. Stack blocks to at least 12 inches but not more than 24 inches above the inlet, depending on design requirements. d. Place wire mesh with ½-inch openings over the outside vertical face of the blocks to keep gravel out of the inlet. e. Place ¾ to 3-inch washed gravel against the wire mesh to the top of the blocks, on slopes of 2:1 or flatter.
7.	<p>Gravel Bag Barriers:</p> <ul style="list-style-type: none"> a. Use bags made of geotextile fabric, not burlap. Fill bags with washed ¾-inch rock or ¼-inch pea gravel. b. Place gravel bags around the perimeter of the drop inlet, packing bags together tightly. For a curb inlet, abut the curb at either side of the inlet opening. c. If additional flow retention is required, construct a barrier upgradient of the inlet by placing gravel bags perpendicular to the direction of flow. Overlap the bags and pack them tightly together. Construct each barrier using several layers of bags. Leave a one bag gap on the top row to act as a spillway to prevent flooding. If more than one barrier is used, place barriers at 20-foot intervals.
8.	<p>Wooden Weir (and Fabric) Curb Inlet Protection:</p> <ul style="list-style-type: none"> a. Construct a wooden weir using 2-inch by 4-inch construction grade lumber, with a total length equal to the throat length plus 2 feet. b. Attach a continuous piece of wire mesh of at least 30 inches in width and a length equal to the inlet's throat

BMP Number & Title	Description
	<p>length plus 4 feet.</p> <ul style="list-style-type: none"> c. Place a piece of approved “extra strength” filter cloth, equal to the dimensions of the wire mesh, over the mesh and secure it to the weir. d. Nail the weir to the 9-inch long vertical spacers, which will be located between the weir and the inlet face at no more than 6-foot intervals. e. Place the assembly against the inlet throat and nail 2-inch by 4-inch boards, in minimum lengths of 2 feet, to the top of the weir at the spacers. Extend these anchors across the inlet tops and hold them in place by sandbags or alternate weight. f. Place the assembly such that the end spacers are at least 1 foot beyond both ends of the throat opening. g. Form the mesh and cloth to the concrete gutter and against the face of the curb on both sides of the inlet. Place coarse aggregate over the mesh and cloth so that water is prevented from entering the inlet either under or around the filter fabric. <p>9. Inspection and Maintenance:</p> <ul style="list-style-type: none"> a. Let ponded water evaporate provided it does not cause a nuisance. b. Inspect before anticipated storms and after storms for gaps, clogging of gravel, ruptured gravel bags, and sediment accumulated behind inlet protection. During extended rainfall events, inspect at least once every 24 hours. c. Carefully remove accumulated sediment when the depth reaches half the height of the inlet protection device. Dispose of sediment properly. Clean or replace gravel that is clogged with sediment. Do not clean gravel near the inlet.
<p>WQ-40 Prevent Water Pollution</p>	<p>Oily, greasy, or sediment laden substances or other material that originate from the 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.</p> <p>The 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:</p> <ul style="list-style-type: none"> 1. where natural turbidity is between 0 and 50 Nephelometric Turbidity Units (NTU), increases will not exceed 5 percent; 2. where natural turbidity is greater than 50 NTU, increases will not exceed 10 percent; 3. 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 project.

BMP Number & Title		Description
		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 project discharges, preferably at least 2 days prior to commencement of operations.
WQ-41	Prevent Stormwater Pollution	Suitable erosion control, sediment control, source control, treatment control, material management, and non-stormwater management BMPs will be implemented consistent with the latest edition of the California Stormwater Quality Association "Stormwater Best Management Practices Handbook," which is available at www.cabmphandbooks.com .
Noise		
NO-1	Minimize Noise Pollution	Noise produced by construction activities will not exceed the applicable local noise ordinance standards.
NO-2	Minimize Disturbances to Residential Neighborhoods Due to Noise	<p>The District will implement practices that minimize disturbances to residential neighborhoods surrounding work sites.</p> <ol style="list-style-type: none"> 1. In general, work will be conducted during normal working hours. Extending weekday hours and working weekends may be necessary to complete some projects. 2. Internal combustion engines will be equipped with adequate mufflers. 3. Excessive idling of vehicles will be prohibited. 4. All construction equipment will be equipped with manufacture's standard noise control devices. 5. The arrival and departure of trucks hauling material will be limited to the hours of construction. <p>The use of jake brakes is prohibited in residential areas.</p>
Transportation/Traffic		
TR-1	Use Suitable Public Safety Measures	Fences, barriers, lights, flagging, guards, and signs will be installed as determined appropriate by the public agency having jurisdiction, to give adequate warning to the public of the construction and of any dangerous condition to be encountered as a result thereof.
Utilities/Service Systems		
UT-1	Manage Sanitary/Septic Waste	Temporary sanitary facilities will be located on jobs that last multiple days in compliance with California Division of Occupational Safety and Health (Cal/OSHA) regulation 8 CCR 1526. All temporary sanitary facilities will be placed outside of the creek channel and flood plain and removed when no longer necessary.

BMP Number & Title		Description
Recreation		
REC-1	Recreation Access and Public Safety Measures	<p>The District or its contractors shall implement the following access and public safety measures during construction:</p> <ol style="list-style-type: none"> 1. Construction signs shall be posted at the work site to warn the public of construction activities and to exercise caution. 2. Where work is proposed adjacent to a recreational trail, bikeway, or sidewalk, warning signs shall be posted several feet beyond the limits of work. Signs shall also be posted if trails, bikeways, or sidewalks shall be temporarily closed. If feasible, detours around the construction site shall be provided. 3. Fencing, either the orange safety type or chain link, shall be installed around the construction zone to exclude recreational users and pedestrians where trails, bikeways, and sidewalks would be closed for construction.

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Chapter 3.0

Environmental Setting and Impact Analysis

3.0 Introduction

3.0.1 Introduction to Environmental Setting and Impact Analysis

Chapter 3, “Environmental Setting and Impact Analysis”, of this DEIR contains 13 subchapters that describe the environmental resources and potential environmental impacts of the Proposed Project. Chapters 3.1 through 3.13 contain the following information about each resource topic:

- description of the environmental setting, as well as background information about the resource topic to help the reader understand the resources that could be affected by the Proposed Project;
- summary of regulations that may affect project activities or resources;
- discussion of the criteria and thresholds used in determining the significance of the Proposed Project’s environmental impacts;
- discussion of the impacts of the Proposed Project on the resource, including the significance of each impact; and
- mitigation measures, including best management practices (BMPs) that would allow the Santa Clara Valley Water District (District) to avoid, minimize, or compensate for any significant impacts.

This EIR has been prepared as a Project EIR. According to State CEQA Guidelines section 15161, a Project EIR shall focus primarily on the changes in the environment that would result from development of all phases of the project, including planning, construction, and operation. Each subchapter of Chapter 3 examines all phases of the Proposed Project.

3.0.2 Sections and Impacts Eliminated from Further Analysis

The District prepared an Initial Study Checklist (IS) for the Proposed Project and circulated the IS for public review along with the Notice of Preparation in January 2013 (see **Appendix A**). The IS evaluated potential environmental impacts associated with the Proposed Project based on preliminary Project information. The District determined in the IS that several potential environmental impacts associated with the Proposed Project were not significant. Those impacts found to be “less than significant” or to have “no impact” could be dismissed from further evaluation in the Project EIR. Based on the IS a few resource subjects were dismissed from further analysis.

Resource Topics and Impacts Dismissed from Further Analysis in the EIR

Aesthetics

The IS dismissed a single aesthetics impact criterion from further analysis because the Project would not have the potential to affect a scenic highway. Specifically, the Proposed Project would not:

- Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a designated scenic highway.

There are no roadways within or near the Project Area that are designated in federal, state, or local plans as a scenic highway or route worthy of protection for maintaining and enhancing scenic viewsheds. While trees would be removed as a component of the Proposed Project, these changes would not affect a designated scenic highway. Highway 280 is eligible for designation as a state scenic highway, but is not officially designated (Caltrans 2012). Therefore, there is no potential for impact to scenic resources from a scenic highway.

Agricultural Resources

The IS dismissed agricultural resources from further analysis because no Prime Farmland, Unique Farmland, Farmland of Statewide Importance, or lands under a Williamson Act contract would be converted by, or conflict with, the Proposed Project. Specifically, the Proposed Project would not:

- Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use;
- Conflict with existing zoning for agricultural use, or a Williamson Act contract; or
- Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use.

The Proposed Project would be confined to the Sunnyvale Channels, contiguous channel easements and immediately adjacent areas. The Sunnyvale Channels are located within an urban setting. No farmland, agricultural land or other zoning for agricultural use is located near the channels. The flood control and water quality improvement activities of the Proposed Project would not result in future conversion of Farmland to non-agricultural use.

Biological Resources

The IS dismissed two biological resources criteria from further analysis because the Project activities are not covered activities under any adopted Habitat Conservation Plan, Natural Communities Conservation Plan, or other approved biological resources plan and because the Project does not have the potential to substantially interfere with wildlife movement. In addition, the IS dismissed further analysis of particular special status species for which impacts would be less than significant. Specifically the Proposed Project would not:

- Interfere substantially with the movement of any native resident or migratory species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan; or
- Have a substantial adverse effect, either directly or through habitat modification, on the following special status species:
 - Northern Harrier
 - American Peregrine Falcon
 - Habitat for and Individuals of Certain Non-breeding Special-status Wildlife Species; and
 - Pacific Harbor Seal.

For many species, the landscape is a mosaic of suitable and unsuitable habitat types. Environmental corridors, such as stream courses, are segments of suitable habitat that provide connectivity between larger areas of suitable habitat, allowing species to disperse through otherwise unsuitable areas. On a broader level, corridors also function as avenues along which wide-ranging animals can travel, plants can propagate, genetic interchange can occur, populations can move in response to environmental changes and natural disasters, and threatened species can be replenished from other areas.

Wildlife Movement. Within the Project Area, the Sunnyvale Channels may function as wildlife movement pathways that allow animals to move along and across the channels. The quality of habitat provided in channel easements and wetland habitats along the Sunnyvale Channels is generally relatively low. Habitats within the existing corridors

have typically been subjected to moderate to high levels of disturbance as a result of the hardening of streambanks, installation of culverts, and other factors associated with the urban surroundings. As a result, many areas have little vegetation, and where vegetation is present, it is mostly dominated by non-native species.

Upstream/south of their crossings with Caribbean Drive, the Sunnyvale Channels, and associated vegetation, can be described as urban and ruderal in context. The channels are typically narrow, channel easements are generally confined on both sides by dense urban development, and channel and easement vegetation is often sparse or non-existent. Both Sunnyvale Channels are routed through several culverts, for up to several hundred feet in a few places. Thus, in the areas upstream (south) of Caribbean Drive, the Sunnyvale Channels likely do not function as high quality movement corridors for most species, particularly special-status species, due to the patchy nature of high-quality habitat and the small, scarce amount of cover in some areas. Downstream (north) of their crossings with Caribbean Drive, the Sunnyvale Channels are more vegetated, have been subjected to lower levels of disturbance, and are surrounded by more open and less developed ruderal habitats, thus providing generally higher quality wildlife habitat and better conditions for wildlife movement.

Even within heavily urbanized areas, the ruderal habitats associated with the Sunnyvale Channels may represent the most direct, feasible avenue for dispersal of mammals, reptiles, and amphibians between the urban areas of central Sunnyvale and less heavily urbanized areas near the edge of the bay. However, the species most likely to use these channels for dispersal are common, urban-dwelling species in the Project Area, such as raccoons and California ground squirrels.

Proposed Project activities that would potentially modify habitat in and around the channels include earthen channel restoration, rock slope protection, other channel modifications, floodwall construction, and bridge/culvert modifications. These activities could have adverse effects on wildlife movement along the channels as a result of impacts on both habitat patch size and connectivity. By creating open areas or patches with unsuitable vegetation types, these activities could impede some wildlife species from moving between patches of habitat along the channels (e.g., species may be less willing to move through areas where vegetation is sparse or absent as it increases their susceptibility to predation). However, proposed activities are not expected to create complete barriers to movement along the channels, as animals will still be able to move along the Sunnyvale Channels through the urban matrix. Further, the installation of rock slope protection could potentially provide some escape cover for small mammals, reptiles, and amphibians moving along the channels, especially in areas where little vegetation exists and no cover is present. As a result, the common, urban-adapted animals that are most likely to move along these channels will be able to continue such movements following Project implementation.

Upstream from Caribbean Drive, the urban matrix through which the channels flow supports a relatively low diversity of common, urban-adapted mammal and reptile species; other than Sierra chorus frogs, it is likely that no native amphibians occur within these heavily urbanized areas. In order to survive and move within such heavily urbanized land uses, such species must be able to tolerate and disperse through and around a variety of anthropogenic obstacles, such as buildings, roads, and fences. When dispersing between urban areas on either side of the Sunnyvale Channels, such animals currently cross the channels via existing crossings such as bridges and culverted areas, or through the water. These animals will be able to navigate through Project components, such as benches (constructed for earthen channel restoration) and rock slope protection, as easily as they are currently able to move within and across the ruderal areas along these channels.

Floodwalls will pose greater impediments to movement by these animals. Although more agile species such as western fence lizards, raccoons, and California ground squirrels may be able to climb over floodwalls and floodwall ramps, species such as striped skunks and gopher snakes may not be able to cross over the floodwalls. Such species would still be able to cross over the channels at bridge/culvert and possibly floodwall ramp locations. Although their ability to cross the channels would be reduced somewhat owing to the distance between bridge/culvert and floodwall ramp locations, these urban-adapted species are expected to be able to cross the channels frequently enough that the Project would not significantly impact wildlife movement within the urban matrix.

Downstream/north of their crossings with Caribbean Drive the Sunnyvale Channels are more vegetated, have been subjected to lower levels of disturbance, and are surrounded by more open and less developed areas, thus providing generally higher quality wildlife habitat. Within this area, mammals and reptiles moving along the edge of the bay and its associated managed ponds and wetlands cross the Sunnyvale Channels (either through the water or via existing bridges and culverted locations), and they may use vegetation along the channels for cover or breeding/foraging habitat. Along the Sunnyvale West Channel, new floodwalls downstream from Caribbean Drive would be limited to a short segment of channel adjacent to the main WPCP area. Animals moving east-west along the edge of the bay would still be able to use existing road crossings at Carl Road and Caribbean Drive, or they can cross the West Channel between these Carl Road and Caribbean Drive, as no floodwalls would be constructed in the middle section of this reach. In addition, animals could possibly use floodwall ramps. Therefore, the Proposed Project would pose little impediment to wildlife movement in an east-west direction across the West Channel.

Along the East Channel, new floodwalls downstream from Caribbean Drive would be more extensive. However, mammals or reptiles attempting to move in an east-west direction across this channel would still be able to use the Caribbean Drive bridge and the footbridge northwest of the City of Sunnyvale's Twin Creeks Sports Complex, which

provide the only two existing above-water crossings of this reach. As a result, the only impediment to movement posed by the floodwalls would be to wildlife attempting to cross across the channel on land; while reptiles may cross through the channel, mammals are expected to do so infrequently. Along the East Channel next to the salt marsh harvest mouse mitigation site, the existing maintenance road levee would be raised. By raising the levee at this location, instead of installing a floodwall, the salt marsh harvest mouse and other wildlife could move up and over the levee and continue moving across the East Channel.

While Project activities are expected to impact wildlife movement both along and across the channel, for the reasons stated above, the Project is not expected to interfere substantially from the existing baseline condition for the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors. Therefore, this impact is considered less than significant.

Conservation Plans. The District is an applicant on two Habitat Conservation Plans (HCPs): the Santa Clara Valley Habitat Plan (an HCP/natural community conservation plan [NCCP]) and the Three Creeks HCP.

Santa Clara Valley Habitat Plan. The Santa Clara Valley Habitat Plan is being pursued by the District along with five other local partners (the County of Santa Clara, the Santa Clara Valley Transportation Authority, and the cities of San Jose, Gilroy, and Morgan Hill) and two resource agencies (CDFG and USFWS). The Proposed Project activities are not considered covered activities under the Santa Clara Valley HCP/NCCP because the Project Area is not included in the HCP/NCCP area. Therefore, the Sunnyvale Channels Project is not subject to conditions of the HCP/NCCP.

Three Creeks Habitat Conservation Plan. This HCP, still under development by the District, provides multiple conservation approaches to address potential impacts caused by District water supply operations, seismic retrofit projects, and dam maintenance activities. Proposed Sunnyvale Channels Project activities are not considered covered activities under this HCP, and thus the Project is not subject to conditions of this HCP.

No other HCPs have been approved or are in preparation in the Project Area, and aside from the Santa Clara Valley Habitat Plan, no NCCPs in Santa Clara County have been approved or are in preparation (CDFG 2012).

Therefore, the Proposed Project would not conflict with any adopted HCPs or NCCPs, or with any other approved local, regional, or state habitat conservation plans, and thus the impact associated with conflicts between the Project and any adopted HCP or NCCP would be less than significant.

Special-status Species. Neither the Northern Harrier (*Circus cyaneus*), a California species of special concern, nor the American Peregrine Falcon (*Falco peregrinus*)

anatum), a state fully protected species, is expected to nest within the Project Area due to the absence of suitable habitat within the Project work area. Thus, the Project would not directly impact any breeding habitat for, or nests of, these species. However, both species are known or expected to breed in the vicinity, and breeding individuals of both species may forage within the Project boundary along the lower Sunnyvale Channels. Therefore, the Proposed Project would have some potential to impact foraging habitats and/or individuals of these species. Project activities may result in a temporary loss of foraging habitat during construction activities and the alteration of foraging patterns (e.g., avoidance of work sites because of increased noise and activity levels during Project activities) but would not result in the loss of individuals. Furthermore, the Project Area does not provide important or extensive foraging habitat used regularly or by large numbers of individuals of either of these species, or heavily relied upon by a nesting pair of either species. Impacts on these species and their habitats resulting from the Proposed Project would be very limited. Accordingly, Project activities would not result in substantial reductions in local or regional populations, and would affect a very low proportion of regionally available habitat. Therefore, such an impact is considered less than significant.

Several special-status species may forage in the Project Area in low numbers, particularly as transients or migrants, but they are not expected to breed at the site or to be present in large numbers. These species include the California Brown Pelican (*Pelecanus occidentalis californicus*), California Least Tern (*Sterna antillarum browni*), Redhead (*Aythya americana*), Western Least Bittern (*Ixobrychus exilis hesperis*), Black Skimmer (*Rynchops niger*), Golden Eagle (*Aquila chrysaetos*), Bank Swallow (*Riparia riparia*), Vaux's Swift (*Chaetura vauxi*), Olive-sided Flycatcher (*Contopus cooperi*), Yellow Warbler (*Dendroica petechia*), Tricolored Blackbird (*Agelaius tricolor*), and western red bat (*Lasiurus blossevillii*). Project construction would not result in injury or mortality of any individuals of these species, which are mobile enough to avoid construction equipment. None of these species is expected to occur on the site in large numbers or use the site regularly, and there would be no substantial loss of foraging or non-breeding habitat for any of these species. As a result, conversion of habitat resulting from the Project would not be expected to have any impact on populations of these species. Thus, the Project would have a less-than-significant impact on these species.

Although the Pacific harbor seal (*Phoca vitulina richardii*) is not on any special-status species list, it is protected by the Marine Mammal Protection Act; therefore, the potential effects of the Project on this species have been evaluated. No pupping sites or major haul-out sites for Pacific harbor seals are present within the Project Area or its vicinity, and the species occurs only as an occasional visitor to Moffett Channel and Guadalupe Slough.

Geology and Soils

The IS dismissed a single geology and soils impact criterion from further analysis because the Proposed Project would not have the potential to destroy a unique geologic feature. Specifically, the Proposed Project would not:

- Directly or indirectly destroy a unique geologic feature.

The Proposed Project is located in an urbanized area underlain by existing geological conditions, consisting of clays, silts, sand, and gravel. The underlying geologic features that would be temporarily affected by ground-disturbing activities from the Proposed Project are common to the surrounding areas. No unique geologic features have been identified in the Project Area. Therefore, no impact to unique geologic features would result.

Hazards and Hazardous Materials

The IS dismissed three hazards and hazardous materials impact criteria from further analysis because the Project would not have the potential to cause an aviation hazard or impair emergency response plans. Specifically, the Proposed Project would not:

- Result in a substantial safety hazard for people or aircraft for a project located within two miles of an airport or in the vicinity of a private airstrip;
- Impair implementation of an adopted emergency response plan; or
- Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

The nearest airport to the Project work area is the Moffett Field Naval Air Station, located approximately 2,000 feet from the West Channel. The site is moderately used for air flights by the California National Guard, NASA, private organizations and the Santa Clara County Sheriff's Department. Although the Project Site is located within two miles of the Moffett Field Naval Air Station, construction activities would be confined to the Project work area (25 feet from the banks of the channels) and would not involve the use of any equipment that would affect aircraft utilizing the airport. As such, the Proposed Project would not result in a substantial safety hazard to people residing in or working in the vicinity of the airport. Therefore, there would be no impact.

The City of Sunnyvale, through its Office of Emergency Services (OES), provides services to the community and departments to prepare for effective response to all types of disasters. At this time there is no official adopted emergency response plan, however the OES does operate the AlertSCC, an emergency notification system to communicate warnings in the event of public safety emergencies. In addition, two volunteer programs, Sunnyvale Neighborhoods Actively Prepare and the Sunnyvale Amateur Radio Emergency Service, are both in place to encourage self-sufficiency and collaboration

between residents in the event of a disaster (City of Sunnyvale 2012). None of the elements proposed by the Project would have an effect on these programs or services. Therefore, there would be no impact on adopted emergency response plans.

Construction-related roadway closures or detours that could affect the provision of emergency services in the vicinity of the work site are discussed in Section 3.12, Transportation and Traffic.

The primary fire season in the Project Area extends from late summer through fall when air temperatures are high and conditions are driest. Fire hazards in Santa Clara Valley are influenced by topography and wind patterns. However, the Project Area is not located in a fire hazard area or within the wildland-urban interface (Santa Clara County 2012). While a slight possibility exists that construction equipment could cause a fire, the risk of exposure of people or structures to fire danger would be very small, and emergency response would be available to respond to any fires. Therefore, impacts are considered less than significant.

Hydrology, Geomorphology, Water Quality

The IS dismissed seven hydrology, geomorphology, and water quality impact criteria from further analysis because the Project would not have the potential to significantly affect water supply or result in adverse flooding, tsunami, seiche, or mudflow impacts. Specifically, the Proposed Project would not:

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local ground water table level (for example, the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);
- Substantially deplete surface water supplies;
- Contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems;
- Place structures within a 100-year flood-hazard area which would impede or redirect flood flows;
- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam;
- Expose people or structures to a significant risk of inundation by seiche, tsunami, or mudflow; or
- Create or contribute substantial additional source of polluted runoff.

Groundwater. The Proposed Project would not involve the direct use of groundwater. Instream construction activities may involve temporary dewatering of stream reaches.

Channel dewatering reduces the channel's ability to recharge groundwater in the specific reach under construction. However, based on summer flows in the Sunnyvale Channels when construction would occur, it is believed that this would be a very small amount of flow diverted for the channel dewatering process. Additionally, the diverted streamflow would be discharged to the channel immediately downstream of the construction zone. In the lower tidal reaches of the Project Area, construction activities may similarly require dewatering. In these locations along the bay fringe where tidal flows occur, the potential impact on groundwater recharge is not significant.

While groundwater recharge is not a primary use or purpose of the Sunnyvale Channels, the earthen portions of the channels bed and banks may allow for groundwater recharge in the non-tidal portions of the channels. Most recharge occurs through the channel bed if it is comprised of porous materials (like sand and gravel) that promote infiltration. Where channel bed or banks are not comprised of porous or permeable materials, such as compacted silt or clay earthen materials, then infiltration functions are greatly reduced. Channel banks may also provide a source for groundwater infiltration. Where the Proposed Project includes bank hardening techniques such as concrete lining, infiltration to groundwater would be restricted in those specific locations. However, due to the limited extent of channel hardening and because the channel bed where the bulk of groundwater recharge occurs would not be affected, restriction of groundwater recharge would be minimal. As a result potential impacts to groundwater recharge would be less than significant.

Surface Water. The Sunnyvale Channels are used for stormwater conveyance and flood control purposes, and are not used to generate surface water supplies. The Proposed Project would use small amounts of water for dust control, mixing of concrete, vehicle cleaning, etc., but not to a level which would cause a substantial depletion of surface water supplies.

Stormwater Drainage Systems. The Proposed Project would not result in the increase or generation of any new runoff sources. The stormwater conveyance capacity of the Sunnyvale Channels would be increased by the Project through development of increased flood conveyance and storage within the channels and contiguous easements. The Proposed Project would not change the existing runoff sources or storm drainage pathways draining to the Sunnyvale Channels. Thus, the general volume of stormwater delivered to the Sunnyvale Channels during a particular storm event would remain unchanged by the Proposed Project.

Overall, the project would not create any runoff water, would be designed to adequately manage existing runoff, and would improve the capacity of existing stormwater drainage systems. Impacts to storm drainage systems are considered less than significant.

Flooding. The watersheds of the Sunnyvale Channels have a history of recurring flooding. Overtopping of the Sunnyvale Channels is known to occur from a combination

of: 1) lack of capacity to convey and store flood flows during heavy storm events, 2) tidal backwatering and storm surge, and 3) backwater flows from San Tomas Aquino Creek during flood events. FEMA mapping of the 100-year floodplain delineates four principal areas within the Sunnyvale Channels that currently would be flooded during a 100-year storm event. In addition, several locations along the Sunnyvale Channels have been identified as having deficient freeboard, based on District freeboard standards (SCVWD 2010).

The Proposed Project would address flooding and freeboard deficiencies by constructing a series of flood protection improvements, including raising levees and installing floodwalls. These flood protection elements would provide 100-year riverine flood protection to 1,618 parcels in the Sunnyvale East Channel watershed and to 47 acres (11 parcels) of industrial and government lands in the West Channel watershed. Though the Proposed Project would place structures (i.e., levees and floodwalls) in areas currently affected by the 100-year storm event, these Project improvements would reduce potential for flooding in these areas and allow for adequate freeboard and flood conveyance capacity. Therefore, this effect is considered beneficial.

Tsunami, Seiche, Mudflow. The California Emergency Management Agency's (Cal EMA) tsunami inundation map shows a potential risk of inundation by tsunamis caused by local and distant faults within the Project Area (Cal EMA 2009). Areas within approximately 1 mile upstream of the outflow of Guadalupe Slough are at risk from tsunami inundation. The shoreline along the San Francisco Bay is also at risk from a seiche, or a standing wave formed in an enclosed or semi-enclosed water body caused by sustained high winds or an earthquake. Some Proposed Project components would be located in areas at risk of inundation from seiches or tsunamis. However, the Proposed Project would not construct new housing or structures for human occupancy. Proposed levee and floodwalls would be located in line or parallel with heightened waves formed by a tsunami or seiche event. Therefore, the project would not exacerbate existing seiche or tsunami risks in the project area. The topography adjacent to the Sunnyvale Channels is low gradient, and there is little risk of mudflow in the Project Area.

Water Quality. The Proposed Project does not involve any actions that would increase the volume of stormwater delivered to the channels. Importantly, the Proposed Project, through reducing the flooding potential in adjacent urban areas, would provide a water quality benefit. The Proposed Project would result in less contaminated runoff entering the Sunnyvale Channels and being transported to downstream sensitive habitat areas compared with baseline conditions. Since the volume and composition of runoff water would be delivered to the Channels would be effectively unchanged, there would be no additional sources of polluted runoff. Therefore, no impact would result. Potential impacts related to exposing contaminated soils are discussed in Section 3.7, "Hazards and Hazardous Materials".

Mineral Resources

The IS dismissed the mineral resources subject from further analysis because no mineral, oil, or gas resource-producing areas or recovery sites are known to be located in the Project Area. In addition, the Proposed Project would not involve any activities that could directly affect mineral production sites or prevent future availability of mineral resources. Specifically, the Proposed Project would not:

- Result in the loss of availability of mineral resources designated priority by the State Department of Conservation or mineral resource recovery site delineated on a local general plan, specific plan or other land use plan.

The Sunnyvale Channels are located primarily in developed and urban areas. Mineral, oil, or gas resource-producing areas are not known to be located in the Project Area. While a number of recently active quarries exist in Santa Clara County, they are all located in undeveloped mountainous areas of the county and not near the Project Area (OMR 2012). Santa Clara County has not designated any mineral resource recovery sites within the Project work area (Santa Clara County 1994). The Project also would not affect any salt production ponds located nearby in South San Francisco Bay. Furthermore, the Proposed Project would not involve any activities that could directly affect mineral production sites or prevent future availability of mineral resources. Therefore, no impact would result.

Population and Housing

The IS dismissed the population and housing topic from further analysis because the Project would not involve the construction of new housing, generate any growth inducement, or disrupt or displace any existing housing units. Specifically, the Proposed Project would not:

- Induce substantial growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure) that was not anticipated in approved local or regional planning documents; or
- Displace substantial numbers of existing housing or residents, necessitating the construction of replacement housing elsewhere.

The Proposed Project would not involve the construction of new housing, nor would it generate any long-term employment opportunities that could cause substantial population growth. The Project would provide 100-year flood protection to an estimated 1,618 parcels adjacent to the Sunnyvale East Channel and 11 parcels adjacent to the Sunnyvale West Channel. As a result of the project, flood insurance rates are expected to decrease for these parcels. Decreased flood insurance rates could make development of currently undeveloped parcels more desirable. Development of currently undeveloped parcels would result in growth inducement.

Recreation areas along the northern portions of both Sunnyvale Channels are expected to be the primary undeveloped areas that would potentially receive flood protection from the Project. These recreational areas are currently highly used. Any other undeveloped areas receiving flood protection are expected to be associated with existing residential, commercial and industrial uses. The City of Sunnyvale General Plan guides development in areas where flood protection would be improved (no protection would be provided to parcels within the City of Cupertino). Due to the highly developed nature of existing land uses and high usage of recreational facilities, it is not expected that flood protection would change the demand for existing land uses. It is expected increased flood protection would further support existing uses. As a result, it is not reasonably foreseeable that the City would change existing land use designations due to increased flood protection provided by the Project.

The flood management benefits of the Proposed Project are not expected to make land parcels that are currently undeveloped more easily developable due to the decrease in flood insurance rates. That is not the focus or objective of the Proposed Project. Rather, the Project provides increased flood protection to existing urban development and infrastructure.

Public Services

The IS dismissed the public services topic from further analysis because the Project would not require additional or altered public facilities. Moreover, once completed, the Project would have an overall benefit to any service providers in the immediate area by reducing the risk of flood threats and damage to properties. Specifically, the Proposed Project would not:

- Result in the need for additional, or physically altered, public services or facilities, the provision of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any public service, including
 - Fire protection
 - Police protection
 - Schools
 - Parks; or
 - Other public facilities.

As noted above the Proposed Project would not result in direct or indirect population growth. As such, the Project would have no impact on demand related to police, fire, parks, schools, or other public services as a result of population growth. Therefore, the Project would not require additional or altered facilities to maintain service ratios or performance objectives due to such demands.

The Proposed Project may result in permanent and/or temporary alterations in portions of adjacent land uses associated with required easement acquisitions, which could in theory affect existing public facilities such as parks. This specific project effect is evaluated in Section 3.9, "Land Use and Planning" and Section 3.11, "Recreation," and no impact conclusion with respect to those effects is made here.

Similarly, construction-related roadway closures or detours could affect the provision of emergency services in the vicinity of the Project Site. These impacts are evaluated in Section 3.12, "Transportation and Traffic," and no impact conclusion with respect to those effects is made here.

Once completed, the Proposed Project would have an overall benefit to any service providers in the immediate area by reducing the risk of flood threats and damage to properties.

Utilities and Service Systems

The IS dismissed one utilities and service systems impact criterion from further analysis because the Project has sufficient water supply entitlements. Specifically, the Proposed Project would not:

- Have insufficient water supplies available to serve the project from existing entitlements.

The Proposed Project would use small amounts of water during construction for dust control, mixing of concrete, vehicle cleaning, etc., but not to a level which would cause substantial water demand that would exceed existing entitlements. This impact is considered less than significant.

Chapter 3.1

Aesthetics

3.1.1 Introduction

This chapter describes potential impacts on aesthetic and visual resources resulting from implementation of the Proposed Project. The Project Area's current visual setting is first described to provide a basis by which to evaluate changes to visual resources caused by the Project. An analysis of temporary and permanent visual impacts resulting from the Project is then presented. Where feasible, mitigation measures are identified to reduce the level of expected impacts. A brief introduction of visual resources concepts and terminology used in this assessment is provided below.

Concepts and Terminology

Identifying a project area's aesthetic and visual resources and conditions involves three steps:

1. Objective identification of the visual features (visual resources) of the landscape;
2. Assessment of the character and quality of those resources relative to overall regional visual character; and
3. Determination of the importance to people, or sensitivity, of views of visual resources in the landscape.

The aesthetic value of an area is a measure of its visual character and quality, combined with the viewer response to the area (FHWA 1988). Scenic quality can best be described as the overall impression that an individual viewer retains after driving or walking through, or flying over an area (BLM 1980). Viewer response is a combination of viewer exposure and viewer sensitivity. Viewer exposure is a function of the number of viewers, number of views seen, distance of the viewers, and viewing duration. Viewer sensitivity relates to the extent of the public's concern for a particular viewshed. These terms and criteria are described in detail below.

Visual Character

Both natural and artificial landscape features contribute to the visual character of an area or view. Visual character is influenced by geologic, hydrologic, botanical, wildlife, recreational, and urban features. Urban features include homes, commercial and industrial buildings, offices, landscaped areas, roads, utilities, structures, earthworks, and other facilities. The perception of visual character can vary significantly on a seasonal basis, and even hourly, as weather, light, shadow, and elements that compose

the viewshed change. The basic components used to describe visual character for most visual assessments are the elements of form, line, color, and texture of the landscape features (USFS 1995; FHWA 1988). The appearance of the landscape is described in terms of the dominance of each of these components.

Visual Quality

Visual quality is evaluated using the well-established approach to visual analysis adopted by the Federal Highway Administration (FHWA), employing the concepts of vividness, intactness, and unity (FHWA 1988; Jones et al. 1975), which are described below.

- **Vividness** is the visual power or memorability of landscape components as they combine in striking and distinctive visual patterns.
- **Intactness** is the visual integrity of the natural and human-built landscape and its freedom from encroaching elements; this factor can be present in well-kept urban and rural landscapes, and in natural settings.
- **Unity** is the visual coherence and compositional harmony of the landscape considered as a whole; it frequently attests to the careful design of individual components in the landscape.

Visual quality is evaluated based on the relative degree of vividness, intactness, and unity, as modified by its visual sensitivity. High-quality views are highly vivid, relatively intact, and exhibit a high degree of visual unity. Low-quality views lack vividness, are not visually intact, and possess a low degree of visual unity.

Visual Exposure and Sensitivity

The measure of the quality of a view must be tempered by the overall sensitivity of the viewer. Viewer sensitivity or concern is based on the visibility of resources in the landscape, proximity of viewers to the visual resource, elevation of viewers relative to the visual resource, frequency and duration of views, number of viewers, and type and expectations of individuals and viewer groups.

The importance of a view is related in part to the position of the viewer to the resource; therefore, visibility and visual dominance of landscape elements depend on their placement within the viewshed. A viewshed is defined as all of the surface area visible from a particular location (e.g., an overlook) or sequence of locations (e.g., a roadway or trail) (FHWA 1988). To identify the importance of views of a resource, a viewshed must be broken into distance zones of foreground, middleground, and background. Generally, the closer a resource is to the viewer, the more dominant it is and the greater its importance to the viewer. Although distance zones in a viewshed may vary between different geographic regions or types of terrain, the standard foreground zone is 0.25–0.5 mile from the viewer, the middleground zone from the foreground zone to 3–5 miles

from the viewer, and the background zone from the middleground to infinity (Jones et al. 1975).

Visual sensitivity depends on the number and type of viewers and the frequency and duration of views. Visual sensitivity is also modified by viewer activity, awareness, and visual expectations in relation to the number of viewers and viewing duration. For example, visual sensitivity is generally higher for views seen by people who are driving for pleasure; people engaging in recreational activities, such as hiking, biking or camping; and homeowners. Sensitivity tends to be lower for views seen by people driving to and from work or as part of their work (USFS 1995; FHWA 1988; SCS 1978). Commuters and non-recreational travelers have generally fleeting views and tend to focus on commute traffic, not on surrounding scenery; therefore, they are generally considered to have low visual sensitivity. Residential viewers typically have extended viewing periods and are concerned about changes in the views from their homes; therefore, they are generally considered to have high visual sensitivity. Viewers using recreation trails and areas, scenic highways, and scenic overlooks are usually assessed as having high visual sensitivity.

Judgments of visual quality and viewer response must be made based in a regional frame of reference (SCS 1978). The same landform or visual resource appearing in different geographic areas could have a different degree of visual quality and sensitivity in each setting. For example, a small hill may be a significant visual element on a flat landscape but have very little significance in mountainous terrain.

3.1.2 Regulatory Setting

There are no roadways within the Project Area that are designated in federal, state, or local plans as a scenic roadway or as a corridor worthy of protection for maintaining and enhancing scenic viewsheds. Additional applicable policies and guidelines are discussed below.

Federal Regulations

No specific federal regulations related to aesthetics are applicable to the Proposed Project.

State Regulations

No specific state regulations related to aesthetics are applicable to the Proposed Project.

Local Regulations

City of Sunnyvale General Plan

The following community design policies contained in the *Sunnyvale General Plan* (City of Sunnyvale 2011) are relevant to the Proposed Project:

Community Character – Design

Policy CC-1.2: Continue to enhance the visibility, accessibility and use of the San Francisco Bay on the City's Northern Boundary.

Policy CC-4.2: Maintain beautiful and comfortable outdoor public places which provide a shared sense of ownership and belonging for Sunnyvale residents, business owners and visitors.

Bay Trail Plan

Senate Bill 100, passed into law in 1987, directed the Association of Bay Area Governments (ABAG) to develop a plan for a 400-mile continuous recreational trail system around the Bay (ABAG 2013). The Bay Trail Plan was adopted by ABAG in July 1989. Senate Bill 100 mandated that the San Francisco Bay Trail (Bay Trail) 1) provide connections to existing park and recreation facilities, 2) create links to existing and proposed transportation facilities, and 3) be planned in such a way as to avoid adverse effects on environmentally sensitive areas. The following policy of the Bay Trail Plan is relevant to aesthetic resources of the Proposed Project:

Trail Alignment Policy 4: Provide a wide variety of views along the Bay and recognize exceptional landscapes. The richness of the Bay is reflected in the widely divergent views from its shoreline - vast expanses of marshland, open expanses of water, the lights of an urban panorama, the bustle of a working waterfront. Each of these scenes represents a valued facet of the San Francisco Bay experience.

Approximately 3.5 miles of the Bay Trail traverse along the Bay through the City of Sunnyvale (City of Sunnyvale 2011). The Bay Trail is located on the northernmost portions of the maintenance roads of the Sunnyvale channels near the City of Sunnyvale Water Pollution Control Plant (WPCP) and Pond A4 (**Figure 3.1-1**).

3.1.3 Environmental Setting

This section discusses the general visual character of the Project Area, key observation points at the Project Area, and general viewer groups at the Project Area and their typical responses and sensitivity. The section then identifies and describes existing

viewpoints of the Project Area that could be affected by the Proposed Project, from the standpoint of visual quality and visual exposure at each location.

Regional Character

Santa Clara County's major topographic features include the Baylands, the Santa Clara Valley, the Diablo Range to the east, and the Santa Cruz Mountains to the west. The Santa Clara Valley is oriented in a north-to-south direction and surrounded by rolling hills. Urbanization has primarily occurred in the northern portion of the valley, where the City of Sunnyvale and the Sunnyvale Channels are located.

Sunnyvale's visual character is defined by a juxtaposition of private and public urban development patterns and natural landscape features. The Baylands are found in the northwestern part of Santa Clara County, adjacent to the waters of the southern portion of San Francisco Bay (Bay), and consist mostly of salt evaporation ponds and areas of salt marsh and wetlands. The Baylands provide relatively flat open expanses of natural wetland features, including many sinuous or geometric shapes and colors. The Baylands provide a visual contrast to the nearby urban areas. Guadalupe Slough, Moffett Channel, and Pond A4 are located in the Baylands adjacent to the Project Area.

Key Observation Points

To identify the potential impacts of the Proposed Project on existing conditions of the visual environment, key observation points (KOPs) were selected. The KOPs selected were determined to be most representative of areas where the Project components have the potential to change existing views available to sensitive receptors and from sensitive viewing areas.

The 16 KOPs (refer to Figure 3.1-1) used to evaluate impacts in this chapter have been selected from 134 candidate KOPs (cKOPs) (refer to **Appendix F** for all cKOP locations) that were photographed within the investigation area during a field investigation on January 23, 2013. Before the field investigation was conducted, locations were evaluated for their potential to have views of the Project Area via Google Maps, in reference to Proposed Project components, and Google Street View. These locations were evaluated for potential views; affected viewer groups; and presence and absence of landform, vegetation, water, and artificial features. After this, the general investigation area for cKOPs was chosen for photo documentation during the field investigation. Because the investigation area is largely urbanized and developed, thus lending itself to mostly limited views of the Project Area, cKOPs generally fall within 50 feet of the Project Area.

In the field, cKOP locations were visited and photographed to document the presence or absence of views of the Project Area, including both the East and West Channels and

along Guadalupe Slough, Moffett Channel, and Pond A4. These were often documented in a 360-degree view to gain an understanding of available views from the perspective of potential viewers and to understand the visual setting. Additional locations were also surveyed and photo documented by driving the roads surrounding the Project Area and capturing the most descriptive views down the roadway corridors and toward the Project Area.

Images from the cKOPs were photographed with a >10 megapixel digital single lens reflex camera equipped with a 50-millimeter equivalent focal length lens. This configuration is the de facto standard that approximates the average view cone and magnification of the human eye. The camera positioning was determined with a sub-meter differentially corrected GPS.

The corresponding KOP photographs shown on Figure 3.1-1 are presented in **Figures 3.1-2A through 3.1-2H** and are considered representative of views of the Project Area.

An important consideration in cKOP selection was that visual impacts are generally based on public views (i.e., views from public roads, trails, or sidewalks than from individual residences), as described above. However, views from individual private properties are also considered in evaluating overall change to the visual character of an area.

Vicinity Character

The Sunnyvale Channels are primarily open-water conveyances, but are also intermittently routed underground through culverts. In open-water conveyance areas, a narrow easement, typically 15 to 25 feet on each side of the channel, is maintained along both banks between the channels and adjacent land uses. The majority of the easements have minimal trees and vegetation. Most easements contain approximately 10- to 15-foot-wide dirt maintenance roads along both banks, which the District uses to access the channels. Fencing of the channel along property lines (easement area) is common. The open channels are mostly characterized by steep earthen slopes. The District has historically repaired bank erosion by installing sacked concrete, rip-rap, or concrete along the channel banks.

Beyond the channel easements, urbanization is prevalent along both Sunnyvale Channels. Primarily, industrial and commercial uses are located adjacent to the West Channel, along with some residences. Residences are the predominant form of development along the East Channel, with some commercial and industrial uses. A few parks are also interspersed with the urban uses along the East Channel and near Guadalupe Slough, Moffett Channel, and Pond A4. Views of the channels are generally provided from parks and road crossings and intermittently from urban land uses. Guadalupe Slough, Moffett Channel, and Pond A4 are located on the margins of the Baylands, adjacent to recreational areas and urbanized areas of the City of Sunnyvale.

The best views of the Baylands exist along adjacent roadways, levees, and recreational trails/roads, including the Bay Trail. The Baylands are visible from Sunnyvale Channels downstream of the Caribbean Drive crossing of both channels.

Sunnyvale East Channel

As described above, the Project Area is highly urbanized and densely developed and only allows for a limited number of direct views of the East Channel. Open space is located between Caribbean Drive and Pond A4, at the northern extent of the East Channel, which is a highly valued and utilized public amenity. This open space is in the form of the Bay Trail and pond/channels levee system; Baylands Park; Twin Creeks Sport Complex; and open water associated with the Baylands, ponds, and Don Edwards San Francisco Bay National Wildlife Refuge (Refuge) (refer to Figure 3.11-1). The remaining length of the East Channel associated with the Proposed Project is bordered on either side by single- and multi-family residential development and local parks, with smaller interspersed areas of commercial development in the form of warehouses and office parks and buildings.

Viewer groups of the East Channel include workers in the commercial areas, motorists, pedestrians, and bicyclists on local roadways and sidewalks crossing the East Channel, and residents in the homes on both sides of the channel. The maintenance roads are not officially open to the public; however, they are informally used for unauthorized recreational use such as walking, jogging, and bicycling. A number of recreationists were seen using the District's access/maintenance roads along the East Channel, between the John W. Christian Greenbelt (Greenbelt) and Tasman Court and between Moffett Park Drive and Caribbean Drive, during the field investigation. The Bay Trail is located to the north of Caribbean Drive and receives a lot of recreational use involving running, walking, and sightseeing. Besides the Bay Trail, the only authorized/official trail within the proposed Project limits is where a Joint Use Agreement (JUA) has been executed between the District and the City of Sunnyvale along Sunnyvale East Channel between N. Britton Avenue and Wolfe Road (approximately 1,200 linear feet). The Sunnyvale East Channel is not visible to the public through much of this trail reach because the channel is contained/flows within an underground box culvert.

Single- and multi-family residential land uses comprise the largest surrounding land use along the East Channel. Most residences adjacent to the East Channel are one-story, single-family residences. There are only a limited number of two-story, single-family residences abutting the channel. Multi-family dwellings tend to be two stories but, in most cases, they face generally inward toward access drives that run perpendicular to the channel and not toward the channel. Most single- and multi-family residences are separated from the channel by fencing and mature landscaping that prevent views of the channel; views of the channel are primarily available from local roadways crossing the channel (refer to Figure 3.1-2A, KOPs 10 and 39). There are only a small number of cases where direct residential views toward the channel exist from second story

windows of single- or multi-family residential units. In addition, there are only a few locations where the channel is not buffered by privacy fencing or landscaping that prevents views of the channel, such as along Britton Avenue where there is only a chain-link fence and no landscape buffer. Most of the channel is not accessible in residential areas because of chain-link fencing that prevents such public access, except for between the Greenbelt and Tasman Court and between Moffett Park Drive and Caribbean Drive.

Most residential land uses have moderate vividness owing to the common nature and predominance of such views. They are also moderately intact and unified owing to the form and design of suburban residential development and manicured nature of mature residential landscaping combined with the presence of utility lines, roadway and railway infrastructure, and interspersed commercial development. Residential areas, overall, have a moderate visual quality. Commercial areas have moderate to moderately low visual quality because they are common to the “big box” design and lack distinctive design features that provide or help to define a sense of place and allow for large expansive areas of pavement and parking with little green space.

Parks are intermixed throughout the residential areas and border the East Channel, such as Ortega, Orchard Heritage, Braly, and Fair Oaks Parks, as well as the Greenbelt. Like residential areas, most views of the channel from these parks are screened by privacy fencing and mature landscaping. However, there are some cases where the channel and its infrastructure are more directly visible from pathways on the edges of parks, such as from Braly and Fair Oaks Parks (refer to Figure 3.1-2B, KOPs 47 and 69) and from the Greenbelt. The East Channel typically enters into an underground box culvert through existing park areas, thus greatly reducing public views of the channel. The Proposed Project is not proposing any work within existing park limits.

The most open and direct views of the Project Area are available to recreationists using the Bay Trail and levee system in the open space lands between Caribbean Drive and Pond A4 (refer to Figures 3.1-2C and 2D, KOPs 89, 93, 96, and 98). These expansive views sweep over the Baylands and toward the rising Santa Cruz Mountains to the southwest and the Black Hills and Diablo Range to the northeast. These allow for picturesque and highly valued views of the surrounding visual landscape and provide a visual reprieve from the highly urbanized, adjacent land uses. However, there are a lot of anthropogenic features, such as lattice steel transmission lines, which detract from views such that the vividness, intactness, and unity of such views would be only moderately high. The overall visual quality of views from these open space lands is moderately high.

Sunnyvale West Channel

As described above, the area surrounding the West Channel is also highly urbanized and densely developed and only allows for a limited number of direct views of the channel. The West Channel is bordered on either side by commercial development in the form of predominantly warehouses and office parks and buildings from Caribbean

Drive south to just south of U.S. Highway (Hwy) 101. There are no residential land uses adjacent to reaches of the West Channel where Project components are proposed. Open space is located between Caribbean Drive and Pond A4, at the northern extent of the West Channel, which is a highly valued and utilized public amenity. This open space is in the form of the Bay Trail and pond/channels levee system; landfill hill and trail system; and open water associated with the Baylands, ponds, and the Refuge.

Viewer groups of this portion of the West Channel include workers in the commercial areas, motorists on local roadways crossing the West Channel, and pedestrians and bicyclists on local roadway or sidewalks crossing the West Channel. As with the East Channel, public use of the maintenance roads along the West Channel is not authorized; however, a number of recreationists were seen using the maintenance roads along the West Channel between West Java Drive and Caribbean Drive (refer to Figure 3.1-2G, KOP 119a) during the field investigation. The Bay Trail (refer to Figure 3.11-1) is located to the north of Caribbean Drive and receives a lot of recreational use for running, walking, sightseeing, and waterfowl hunting access.

The most open and direct views of the Project Area are available to recreationists using the Bay Trail and levee system in the open space lands between Caribbean Drive and Pond A4 (refer to Figures 3.1-2E through 2G, KOPs 103, 106, 108a, 108b, 113, and 119b). These expansive views sweep over the Baylands and toward the rising Santa Cruz Mountains to the southwest and the Black Hills and Diablo Range to the northeast. These allow for picturesque and highly valued views of the surrounding visual landscape and provide a visual reprieve from the highly urbanized, adjacent land uses. However, there are a lot of anthropogenic features, such as lattice steel transmission lines and the WPCP, which detract from views such that the vividness, intactness, and unity of such views would be only moderately high. The overall visual quality of views from these open space lands is moderately high.

Similar to residential areas along the East Channel, most commercial areas along the West Channel are separated from the channel by fencing and mature landscaping that prevent views of the channel, and views of the channel are primarily available from local roadways crossing the channel (refer to Figure 3.1-2H, KOP 130). Parking lots adjacent to the channel also provide for occasional limited views of the Project Area. The West Channel is not accessible in the southern portion of commercial areas because of chain-link fencing or dense mature landscaping that prevent such public access. Unauthorized public access is available between the Bordeaux Drive to Caribbean Drive in commercial areas (refer to Figures 3.1-2G and 2H, KOPs 119a and 119b). Commercial areas have moderate to moderately low visual quality because they are common to the “big box” design and lack distinctive design features that provide or help to define a sense of place and allow for large expansive areas of pavement and parking with little green space.

Existing Viewer Groups and Viewer Responses

The following viewer groups have visual access to the Project Area: recreation users, residents, motorist, and workers. The general sensitivity of these viewer groups to visual changes are characterized as follows:

- **Residents.** Residents are individuals whose homes are near the Project Area. Similar to recreationalists, viewer sensitivity is moderately high among residents because they are likely to value their local visual resources highly, appreciate the visual experience, and be more sensitive to changes in views.
- **Workers.** Workers are individuals whose place of employment is near the Project Area, or who may come into contact with the Project Area as part of their work activities (e.g., delivery persons). Viewer sensitivity is moderate among workers; they are generally not as focused as residents on the visual resources surrounding their workplace, and will be less sensitive to changes in views.
- **Motorists.** Motorist use roadways at varying speeds; normal highway and roadway speeds differ based on the traveler's familiarity with the route and roadway conditions (e.g., presence/absence of rain). Single views typically are of short duration, except on straighter stretches where views last slightly longer. Motorists who frequently travel these routes generally possess low to moderate visual sensitivity to their surroundings. The passing landscape becomes familiar to these viewers, and their attention typically is not focused on the passing views but on the roadway, roadway signs, and surrounding traffic. Motorists who travel local routes for sight-seeing purposes generally possess a higher visual sensitivity to their surroundings because they are likely to respond to the natural environment with higher regard and as a holistic visual experience.

Viewer sensitivity is moderately low among most roadway travelers expected to view the Project Area. The passing viewshed becomes familiar to frequent viewers; further, at standard roadway speeds, views are of short duration and roadway users are primarily focusing on surrounding traffic, road signs, and their immediate surroundings within the automobile, with generally fleeting views other visual features.

- **Recreational Users.** Recreation uses in the Project vicinity include a variety of activities, such as walking, jogging, biking, dog-walking, and bird watching, particularly along the Bay Trail. Besides the Bay Trail, the only authorized/official trail within the Proposed Project limits is the approximately 1,200 linear feet along Sunnyvale East Channel between N. Britton Avenue and Wolfe Road where the District has a JUA with the City of Sunnyvale. The Sunnyvale East Channel through much of this trail reach is not visible to the public because the channel is contained within an underground box culvert. Viewer sensitivity is moderately high among recreationists because they are more likely to value the natural environment highly, appreciate the visual experience, and be more sensitive to changes in views.



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Figure 3.1-1
Key Observation Point and Photo Simulation Locations



KOP 10. Looking south toward the Project Site from Dunholme Way near single-family residential land uses.



KOP 39. Looking east toward the Project Site from off of Michelangelo Drive near multi-family residential land uses.

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Figure 3.1-2A
Representative Photographs



KOP 47. Looking southwest toward the Project Site from Braly Park.



KOP 69. Looking north toward the Project Site from Fair Oaks Park.

00397.12 (8/13)

Figure 3.1-2B
Representative Photographs



KOP 89. Looking northeast toward the Project Site and the Bay Trail from the East Channel levee maintenance road off of East Caribbean Drive.



KOP 93. Looking west toward the Project Site from the Bay Trail, directly adjacent to Pond A4.

00397.12 (8/13)

Figure 3.1-2C
Representative Photographs



KOP 96. Looking west toward the Project Site from the Bay Trail, directly adjacent to Twin Creeks Sport Complex.



KOP 98. Looking southeast toward the Project Site from the Bay Trail, directly adjacent to Pond A4.

00397.12 (8/13)

Figure 3.1-2D
Representative Photographs



KOP 103. Looking northeast toward the Project Site from the Bay Trail, directly adjacent to Sunnyvale Water Pollution Control Plant.



KOP 106. Looking south toward the Project Site and the Santa Cruz Mountains from landfill hill trail, west of the Sunnyvale Water Pollution Control Plant.

00397.12 (8/13)

Figure 3.1-2E
Representative Photographs



KOP 108a. Looking northeast toward the Project Site and the Black Hills and Diablo Range from the Bay Trail, directly adjacent to Moffett Channel.



KOP 108b. Looking east toward the Project Site and the Black Hills and Diablo Range from the Bay Trail, directly adjacent to Moffett Channel.

00397.12 (3/13)

Figure 3.1-2F
Representative Photographs



KOP 113. Looking southeast toward the Project Site and the Sunnyvale Water Pollution Control Plant from the Bay Trail.



KOP 119a. Looking southwest toward the Project Site and the Santa Cruz Mountains from East Caribbean Drive.

00397.12 (3/13)

Figure 3.1-2G
Representative Photographs



KOP 119b. Looking northeast toward the Project Site from East Caribbean Drive.



KOP 130. Looking east toward the Project Site from North Mathilda Avenue.

00397.12 (8/13)

Figure 3.1-2H
Representative Photographs



Notes:

- 1) After these simulations were prepared, the project design was revised to raise the heights of the existing levees north of Caribbean Drive. As a result, the proposed flood walls will appear shorter than depicted in this simulation.
- 2) Walls would be constructed with a form liner to create a trapezoidal rib, textured surface.

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Figure 3.1-3
Existing and Simulated Views at KOP 93, East Channel,
Looking West from Bay Trail, North of Twin Creeks Sports Complex



Notes:

- 1) After these simulations were prepared, the project design was revised to raise the heights of the existing levees north of Caribbean Drive. As a result, the proposed flood walls will appear shorter than depicted in this simulation.
- 2) Walls would be constructed with a form liner to create a trapezoidal rib, textured surface.

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Figure 3.1-4
Existing and Simulated Views at KOP 90, East Channel,
Looking North from Bay Trail, West of Twin Creeks Sports Complex



Notes:

- 1) After these simulations were prepared, the project design was revised to raise the heights of the existing levees north of Caribbean Drive. As a result, the proposed flood walls will appear shorter than depicted in this simulation.
- 2) Walls would be constructed with a form liner to create a trapezoidal rib, textured surface.

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Figure 3.1-5
Existing and Simulated Views at KOP 108, West Channel,
Looking East along Levee North of Sunnyvale Water Pollution Control Plant

Existing View



Simulated View



Notes:

- 1) After these simulations were prepared, the project design was revised to raise the heights of the existing levees north of Caribbean Drive. As a result, the proposed flood walls will appear shorter than depicted in this simulation.
- 2) Walls would be constructed with a form liner to create a trapezoidal rib, textured surface. Walls along the maintenance road ramp would be tapered as depicted in Figure 2-5. Tapered portions of floodwalls would include chain link fencing for public safety.

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Figure 3.1-6
Existing and Simulated Views at KOP 106, Overlooking the West Channel,
Looking Northeast, from West of Sunnyvale Water Pollution Control Plant

3.1.4 Impact Analysis

Criteria for Determining Significance

For the purposes of this analysis, the Proposed Project would result in a significant impact on aesthetic resources if it would:

- a) have a substantial adverse effect on a scenic vista;
- b) substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway;
- c) substantially degrade the existing visual character or quality of the site and its surroundings; or
- d) create a new source of substantial light or glare that would adversely affect day or nighttime public views.

Topics Dismissed in the Initial Study Checklist

The Initial Study Checklist dismissed potential impacts on scenic highways from further analysis because there are no roadways within or near the Project Area that are designated in federal, state, or local plans as a scenic highway or route worthy of protection for maintaining and enhancing scenic viewsheds.

Methodology

Using the concepts and terminology described at the beginning of this section and criteria for determining significance, as described above, analysis of the visual effects of the project are based on:

- direct field observation from vantage points, including neighboring buildings, property, and roadways (conducted January 23, 2013);
- photographic documentation of key views of and from the Project Area;
- evaluation of regional visual context;
- review of Project construction drawings;
- review of the Project with regard to compliance with state and local ordinances and regulations and professional standards pertaining to visual quality; and
- evaluation of photo simulations to help determine Project impacts.

Routine maintenance activities will continue at the Sunnyvale Channels that could temporarily alter aesthetics include trash and debris removal, vegetation maintenance, sediment removal, graffiti removal, and bank stabilization. However, this EIR does not evaluate Project maintenance activities that are described and analyzed under the

District's Stream Maintenance Program Subsequent EIR (refer to Chapter 2, "Project Description"). The Stream Maintenance Program Final Subsequent EIR is available for review online: <http://valleywater.org/SMPSEIR2011.aspx>. See Volume 2, Chapter 3, Section 3.1 for the Aesthetics impact discussion.

Preparation of Photo Simulations

Computer-generated photo simulations were produced using digitized photographs and computer modeling and rendering techniques to document and evaluate the visual changes that would result from implementing the proposed Project. The simulations illustrate Project components from four locations. Simulation vantage points, shown on Figure 3.1-1, were selected to provide representative public views from which Project components would be most visible and are illustrated in **Figures 3.1-3** through **3.1-6**. This includes locations where floodwalls would be highly visible to a large number of recreational viewers using the Bay Trail, nearby trails, and maintenance roads adjacent to the Bay Trail. These simulation locations and features represent visual effects across the length of the Project Area, illustrate a representative sample of potential visual changes, and serve to help readers correlate how visual effects would translate to other site-specific locations that were not simulated.

The before and after simulations provide images of the location, scale, and visual appearance of Project components as proposed in this EIR, in an unmitigated state. The simulations were developed through an objective analytical and computer modeling process and are accurate within the constraints of the available data of Project design and the Project Area. (A 3-dimensional computer model was created using a combination of AutoCAD files and geographic information system layers and exported to Autodesk's 3-dimensional Studio Max for production). Design data—engineering drawings, elevations and cross sections, site and topographical contour plans, concept diagrams, and reference pictures—were used as a platform from which digital models were created. In cases where detailed design data were unavailable, more general descriptions about Project components and their locations were used to prepare the digital models.

Although the Project components may continue to undergo design refinement through final design stages, these refinements would not be expected to result in substantial differences in individual features that would affect the outcome of the visual impact analysis. Finally, the analysis assumes that any shifts in specific feature configurations or new Project components would be minor. Therefore, the simulations are considered appropriate and representative of the type and extent of possible visual changes to the Project Area.

Environmental Impacts Analysis Format

The evaluation of temporary construction impacts is presented by type of Project component, such as floodwalls, rock slope protection, and bridge/culvert modifications.

However, as described in the “Environmental Setting” section above, the area surrounding the Project Area is highly urbanized and densely developed and only allows for a limited number of direct views of the Sunnyvale Channels. Portions of both the Sunnyvale Channels share the same visual character and visual conditions that allow for visual impacts associated with Project components to be analyzed in conjunction with one another under a broader visual landscape zone. Permanent impacts are addressed further below under these landscape zones. These landscape zones can be categorized under three main groupings and, for the purposes of this analysis, are referred to as the Open Space Baylands, Commercial, and Residential Zones.

- **Open Space Baylands Zone.** Open space is located between Caribbean Drive and Pond A4, at the northern extent of the Sunnyvale Channels. This open space is in the form of the Bay Trail and pond/channels levee system; Baylands Park; Twin Creeks Sport Complex; landfill hill and trail system; and open water associated with the Baylands, ponds, and the Refuge. Affected viewer groups primarily include recreational users. The visual quality of views from open space lands is moderately high.
- **Commercial Zone.** Along the East Channel, there are smaller interspersed areas of commercial development in the form of warehouses and office parks and buildings. These areas are generally located along the channel, between Caribbean Drive and State Route (SR) 237; northwest of the channel intersection with Tasman Drive, East Arques Avenue, and Central Expressway; and east of the channel between Central Expressway and East Evelyn Avenue. The entire length of the West Channel associated with the Project, south of Caribbean Drive, is commercial. Affected viewer groups primarily include workers and motorists. The visual quality of commercial areas is moderate to moderately low.
- **Residential Zones.** Residential development is not located along the length of the West Channel associated with the Project. The majority of the East Channel associated with the Proposed Project is bordered on either side by single- and multi-family residential development and local parks. Residential development is located between SR 237 to Inverness Way, excluding the interspersed commercial areas listed above for the East Channel. Affected viewer groups primarily include residents and motorists. The visual quality of residential areas is moderate.

The permanent impacts of Project components will be discussed as they affect each landscape zone, as a whole, and are not focused on site-specific analysis of components along the length of the Project. This format will avoid undue repetition of analysis. However, there may be instances where additional detail is warranted, in which case a more detailed analysis at a more site-specific level will be included.

The impact discussions below are structured as follows: First, the environmental impacts of the Proposed Project in the absence of best management practices (BMPs) are discussed. The discussion then presents applicable District BMPs that would avoid or minimize the level of impact. A conclusion regarding the significance of the environmental impact is then made (considering implementation of the District BMPs, as applicable). If the impact would be significant even with use of BMPs, mitigation measures (MMs) are prescribed. The residual significance of each impact following application of the MMs is then provided.

Impact AES-1: Temporary Visual Impacts Resulting from Construction

Activities – Less than Significant with Mitigation

A variety of construction activities have the potential to result in short-term temporary visual impacts.

Construction Activities Common to all Project Components

Construction of all Project components would generally occur from May through November for two construction seasons. Construction would take place during the work week, for up to 8 hours per day, and typically occur during daylight hours (between 8 a.m. and 5 p.m.). Nighttime work would not be regularly scheduled but may occasionally take place on a temporary basis, when necessary. During construction, individual Project components would be built; however, viewers would tend to see construction and construction activities as a whole visual scene made up of the various components.

Construction would introduce considerable heavy equipment, such as excavators, graders, dozers, sheepsfoot rollers, dump trucks, end loaders, support pickups, and water trucks, into the viewshed of all viewer groups in the Open Space Baylands, Commercial, and Residential Zones. However, construction work would typically occur at one channel roadway crossing or channel reach (defined as the area between two roadway crossings) for a short period of time and then move on to a new location along the channel alignments. The Open Space Baylands Zone would be the most affected zone during construction owing to direct and open views toward the Project Area and availability of vista views. The Commercial Zone is generally separated from the channels by fencing and mature landscaping that would prevent views of much of the construction occurring along the channels, except for occasional limited views from adjacent parking lots. Construction along the channels within the Residential Zone would mostly be available from local roadways crossing the channel, because most single- and multi-family residences and nearby parks are separated from the channels by fencing and mature landscaping that would prevent views of construction. There are only a small number of cases where residences would have direct views of construction from second-story windows of single- or multi-family residential units. There would be more direct views of construction from portions of Braly and Fair Oaks Parks where there is little to no visual buffer.

Construction and construction traffic is a common visual element in urbanized areas, and traffic associated with the Project would be temporary, appear similar to existing construction traffic, and would not degrade aesthetics. Earthmoving activities and associated heavy equipment and vehicles would be visible and have the potential to create dust clouds that would attract attention from visual receptors and reduce the availability of short-range views.

Construction of all Project components would create some level of increase in local ambient glare as a result of sunlight being reflected by glass and metal surfaces of construction equipment and materials. However, this would be a temporary effect, and would be limited in extent and severity because the number of construction vehicles and other potential glare sources present on any given site, at any one time, would be limited.

Staging Areas

Staging would occur within the District's existing easements/right-of-way (ROW) and other areas along both channels where the District would acquire temporary construction easements (TCEs) (refer to information in Figure 3.9-11 and Table 3.9-1, including for easement reference numbers used below). Staging areas in the ROW would be used as needed for construction along each Project Area reach. The staging areas would be dismantled once construction near the staging area is complete or once Project construction is complete. The following staging areas would be used for up to 30 months and throughout the entire construction period: staging areas 12, 15, 16, and 17 on the East Channel and 13 and 14 on the West Channel. Other staging areas along the West Channel – staging area 3 through 9 – would be used for between 3 and 6 months.

Staging areas 12 and 15 are in the Open Space Baylands and Residential Zones where recreational users have direct visual access to the sites from sidewalks, pathways, or trails. Staging areas could temporarily detract from recreational enjoyment of these sites. Staging area 17 is bordered on all sides by highly traveled roadways and could serve to possibly distract motorists, in an area where several roadways merge, who may glance over toward the site. Staging areas 13 and 14 are on a vacant parcel in the Commercial Zone where traffic is generally at a lower speed and without complex traffic patterns. All staging areas would go back to their original usage after construction is complete.

Floodwalls, Levee Modifications, Maintenance Road Modifications, Rock Placement, and Bridge and Culvert Modifications

Construction of floodwalls, levee modifications, maintenance road improvements, rock slope protection, and bench construction with rock would all occur on or directly adjacent to the existing levees and maintenance roads and within the channel or channel easements. These activities would mostly be visible within the Open Space Baylands Zone and from roadway crossings within the Commercial and Residential Zones. Tunnel-like vista views of the Santa Cruz Mountains are generally available in all zones

when looking to the southwest from roadway crossings and along the channel corridors where maintenance roads are accessible and used for recreation. There is no in-stream channel work proposed downstream of the Carl Road crossing of the Sunnyvale West Channel and no in-stream channel work is proposed downstream of the Caribbean Drive crossing of the Sunnyvale East Channel. Excavation, grading, and material placement would take place in various locations along the alignments, creating some temporary visual disruption, but disturbances would cease once construction on that segment is complete.

Bridge and Culvert Modifications

During construction, temporary lane closures and directional and safety signage would be required to construct the modifications (refer to Impact TR-1 in Chapter 3.12, "Traffic and Transportation"). Road work is a common visual element in urbanized areas and all viewer groups in Open Space Baylands, Commercial, and Residential Zones would be familiar with such activities; therefore, temporary construction impacts on aesthetics would be minimal.

Nighttime Construction

If nighttime construction is required, the use of high-intensity lighting to illuminate construction activities could result in negative visual impacts if such activity were to take place within the Residential Zone. While construction at night would be limited and temporary, such lighting could flood into residential homes and onto properties, causing nuisance lighting.

Applicable Best Management Practices

There are no District best BMPs that directly relate to aesthetic resources. However, there are District BMPs that indirectly relate to aesthetic resources. The District would implement BMPs AQ-1, AQ-2, BI-10, BI-11, and BI-13, which would indirectly improve aesthetics during construction activities. The full text of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP AQ-1: Use Basic Dust Control Measures for All Construction Sites

BMP AQ-2: Use Enhanced Dust Control Measures for Sites Greater Than Four Acres in Size

BMP BI-10: Minimize Impacts to Vegetation Whenever Clearing (or Trimming) is Necessary

BMP BI-11: Minimize Root Impacts to Woody Vegetation

BMP BI-13: Plant Local Ecotypes of Native Plants and Choose Appropriate Erosion-Control Seed Mixes

Conclusion

Short-term impacts related to new sources of glare would be less than significant. Implementing BMPs AQ-1 and AQ-2 would require the District to implement Bay Area Air Quality Management District (BAAQMD) dust control measures to help to reduce the creation of dust clouds that would negatively affect short-range views. Implementing BMPs BI-10, BI-11, and BI-13 would reduce short-term visual impacts of disturbed ground surfaces by minimizing cutting of woody vegetation, pruning woody vegetation so that no post-construction impacts accrue, ensuring the root systems remain intact, and re-planting with native plants if necessary. Implementing these BMPs would help to reduce visual impacts associated with construction. However, potentially significant impacts may still result from visibility of construction staging areas in the Open Space Baylands and Residential Zones and nighttime lighting in the Residential Zone. The District would implement the following mitigation measures (MMs) to reduce visual impacts associated with construction staging areas and nighttime lighting.

Mitigation Measure AES-1: Provide Visual Screening for Construction Staging Areas in Open Space Baylands and Residential Zones.

The District would require contractors to provide visual screening around portions of construction staging areas that will be visible during the entirety of a construction season. The fencing would buffer the visual effects in construction areas, including from equipment parking and materials storage, on aesthetic values for recreational viewers on the Bay Trail and residents of the neighborhoods adjacent to the staging areas. Screening would consist of 8-foot-high chain-link fence covered with fabric, privacy slats, or an equivalent visual blockage. The fence would be put in place during the first week of construction, and would remain until construction is complete and equipment is demobilized from the area. The location of the visual screening may be adjusted depending on where construction activities are occurring.

Mitigation Measure AES-2: Minimize Fugitive Light from Portable Sources of Light Used for Construction within Residential Zones.

The construction contractor shall minimize Project-related light and glare within residential zones to the maximum extent feasible, given safety considerations, when construction at night is required. Color-corrected halide lights would be used. Portable lights would be operated at the lowest allowable wattage and height and will be raised to a height no greater than 20 feet. All lights would be screened and directed downward toward work activities and away from the night sky and nearby residents, to the maximum extent possible. The number of nighttime lights used would be minimized to the greatest extent possible.

Implementing MM AES-1 would ensure that residential viewers and recreationists utilizing public open space are minimally affected by construction staging areas.

Implementing MM AES-2 would ensure that residential viewers and motorists are safely and minimally affected by nighttime construction activities. With the implementation of these MMs, construction would not substantially affect aesthetic resources associated with the Project Area or act to lessen the overall visual quality of the Open Space Baylands, Commercial, and Residential Zones.

Therefore, based on the assessment above, the temporary impacts to aesthetic resources due to construction activities would be less than significant with mitigation.

Impact AES-2: Permanent Alteration of the Visual Character or Quality of the Project Area, Including Scenic Vistas from Floodwalls – Less Than Significant

Floodwalls in Open Space Baylands Zone

The Project component that would cause the most notable visible changes in the Open Space Baylands Zone would be the inboard and outboard floodwalls. While the Open Space Baylands Zone already has anthropogenic features (e.g., transmission lines, signage, buildings and tanks associated with the WPCP, Twin Creeks Sport Complex), floodwalls would increase the amount of vertical hardscape features present in this zone. More importantly, floodwalls would introduce an abrupt and hardened surface along the creek corridor, which didn't previously exist in the Open Space Baylands Zone. Floodwalls would generally be 3 feet tall and would be higher at road crossings to prevent flow overtopping. At the Caribbean Drive crossing of the Sunnyvale East Channel, floodwalls would be approximately 8 feet tall. At the Carl Road crossing of the Sunnyvale West Channel, floodwalls would be approximately 7 feet tall. The outboard floodwalls along the Sunnyvale East Channel extending north and west within the Open Space Baylands Zone (refer to Figure 2-3d) would taper down from the road crossing to an average height of 3 feet above the finished levee surface. Similarly, inboard and outboard floodwalls extending along the Sunnyvale West Channel extending north and west from the Carl Road crossing (refer to Figure 2-3a) would taper down from 7 feet tall to an average height of 4.5 feet (range from 4 to 5 feet) above the finished levee surface.

The proposed location and height of floodwalls on the Sunnyvale East Channel in the Open Space Baylands Zone would act to limit views to features beyond the channel (middle ground and more distant views). This effect can be seen in Figure 3.1-3, where views of the Twin Creeks Sport Complex to the left (south) of the creek channel would be obscured by the outboard floodwalls as seen from KOP 93¹. Floodwalls at KOP 93 would not affect scenic vistas of the ponds and the southern portion of the Bay, which are backdropped by the Santa Cruz Mountains to the southwest. The floodwall proposed

¹ The simulation in Figure 3.1-3 depicts the floodwall at approximately 5 feet, but the floodwall would be closer to 3 feet high in this location.

further upstream on the opposite bank of the Sunnyvale East Channel, as the channel approaches Caribbean Drive would not be clearly visible beyond the Bay Trail pedestrian bridge crossing.

The potential for floodwalls to limit views increases where outboard floodwalls occur on both sides of the channel (refer to Figure 2-3d) and, subsequently, creates an enclosed condition where the trails on each the levee are lined with a floodwall. This condition would occur where outboard floodwalls are proposed on the Sunnyvale East Channel downstream from Caribbean Drive up to the pedestrian bridge, as seen in Figure 3.1-4. The outboard floodwalls proposed on both sides of the channel would generally limit views from KOP 90 when looking east and west¹. Floodwalls taller than 3 feet would obscure views of adjacent landscape elements, such as vegetation and built features. This floodwall configuration also acts to create a tunnel-like corridor that directs views down the alignment, as illustrated in the simulation in Figure 3.1-4, generating a slight sense of enclosure and confinement. While views of the ponds, Bay, and the Black Hills and Diablo Range would still be visible, the horizon would be narrowed and the vista more segmented by the visual obstruction created by the floodwalls in the Open Space Baylands Zone. This acts to decrease the visual quality of views and vistas seen from this KOP. As described in the Project Description, floodwalls at this location would be 3 feet tall and therefore, would not pose a substantial visual obstruction in the Open Space Baylands Zone because the wall height would allow for views out and over the landscape, and would not create as great of a sense of enclosure.

Similarly, views in the Open Space Baylands Zone can be limited where both inboard and outboard floodwalls are present, such as is proposed for the Sunnyvale West Channel downstream from Carl Road (refer to Figure 2-3d) and as seen in Figure 3.1-5¹. Inboard and outboard floodwalls would act to prevent views of aquatic vegetation lining the channel and water within the Sunnyvale West Channel. As illustrated in Figure 3.1-5 at KOP 108, the floodwall placement on the west levee of the Sunnyvale West Channel has been designed in a manner such that it would not affect scenic vistas of the ponds and the Bay that are backdropped by the Black Hills and Diablo Range to the northeast. Lastly, when seen at the elevated vantage from the landfill hill and trail system, the latter being highly used by recreational viewers, the inboard and outboard floodwalls proposed on the Sunnyvale West Channel would not greatly detract from the visual quality and would not affect scenic vistas seen from KOP 106, as shown in Figure 3.1-6. At ground level, outboard floodwalls proposed along the east levee of the Sunnyvale West Channel adjacent to the WPCP would partially screen views of the plant facilities visible from the adjacent Bay Trail. The wall along the east levee would limit views of infrastructure associated with the WPCP seen by recreational users and could improve the recreational experience; a beneficial effect.

All of the floodwalls proposed in the Open Space Baylands Zone would be constructed with a trapezoidal rib texture that would help to provide some visual interest to the wall

surface compared to a smooth wall surface. Floodwalls proposed along the Sunnyvale East and West Channels would be an average of 3 feet tall and would thus not pose a substantial visual obstruction in the Open Space Baylands Zone. Recreational viewers may perceive the floodwalls to be a visual intrusion or visually unappealing, while motorists may have little concern over the floodwall.

Floodwalls in Commercial Zone

Commercial areas are likely to be minimally affected by the Proposed Project because of the limited amount of available views of the Project Area and similarities in the nature of Project components to existing features, where visible.

The existing views most likely to be affected by the Proposed Project are views where floodwalls are proposed, including views from roadways crossing and parking lots adjacent to the channels. Many views of the floodwalls would be obscured, partially or fully, by fencing and mature vegetation. The height of visible new hardscape created by the floodwalls would be an average of 3 feet above the existing top of the channel bank and would extend 7-8 feet tall at road crossings. These floodwall segments would limit views at certain locations when viewers are approaching or are parked near the wall and are in their vehicles. Figures 3.1-3 through 3.1-5 are representative of such an impact. These viewers would see the wall while in their vehicles and would have partially obstructed views once they exit their vehicles, because the ground plane between the parking lot and the channels would no longer be immediately visible. Features taller than the floodwalls, such as trees and buildings, would still be visible rising above the wall. This same impact would be seen by viewers walking within nearby areas of the parking lot and using building sidewalks and outside entry areas.

The 3-foot-high floodwalls on either side of the channels would be in keeping with the tunnel-like vista views that are currently available to motorists traveling over roadway crossings. The floodwalls would not obscure vista views of the Santa Cruz Mountains, which are generally available when looking to the southwest. Figure 3.1-4 is representative of such an impact. This floodwall configuration, however, acts to exaggerate the tunnel-like corridor that directs views down the alignment, as illustrated in the simulation, generating a slight sense of enclosure and confinement. This acts to slightly decrease the visual quality of views. Motorists would not be greatly affected owing to the short duration of visual contact with the site that is seen in passing.

Floodwalls could result in a substantial aesthetic impact because some workers may perceive the floodwalls to be a visual intrusion or visually unappealing, while other workers and motorists may have little concern over the floodwalls.

Floodwall ramps would have a similar impact. However, there would be few viewers affected by the height of the ramps in commercial zones. Motorists and workers parking

in lots adjacent to the channels would pass by these locations quickly, and they would not substantially alter available views or scenic vistas.

Floodwalls in Residential Zone

The existing views most likely to be affected by the Proposed Project are views where the proposed floodwalls are visible from a limited number of residences with second-story views toward the Project Area and at roadway crossings. Floodwalls would be built primarily along the length of the East Channel, between Persian Drive and Hwy 101 and short segments along the East Channel near East Evelyn Avenue. Many views of the floodwalls would be obscured, partially or fully, by fencing and mature vegetation. The height of visible new hardscape created by the floodwalls would vary, extending roughly 4.0–4.5 feet above the existing top of the bank. Most residences along the channel at these locations have 6-foot-high wooden fences, and the floodwalls would be shorter than these fences. In addition, vegetation is growing along large segments of the fence line, on the channel side of the fences, which further acts to screen views of the floodwalls. However, between Persian and Tasman Drives, residences are at a lower grade than the channel levees, such that adjacent residents would have more readily available views looking up the levee slopes toward the floodwalls.

The 4.0- to 4.5-foot-high floodwalls on either side of the channels would be in keeping with the tunnel-like vista views that are currently available to motorists traveling over roadway crossings. This would not obscure vista views of the Santa Cruz Mountains, which are generally available when looking to the southwest. Figure 3.1-4 is representative of such an impact. This floodwall configuration, however, acts to exaggerate the tunnel-like corridor that directs views down the alignment, as illustrated in the simulation, generating a slight sense of enclosure and confinement. Features taller than the floodwalls, such as trees and buildings, would still be visible rising above the wall. The tunnel-like corridor acts to slightly decrease the visual quality of views. Motorists would not be greatly affected owing to the short duration of visual contact with the site that is seen in passing.

Floodwalls could result in a substantial aesthetic impact, because some residents may perceive the floodwalls to be a visual intrusion or visually unappealing, while other residents and motorists may have little concern over the floodwalls. However, without flood protection at these locations, the increased risk of flooding has the potential to alter the greater visual environment in a more unpredictable and potentially severe manner in a densely populated residential area where residences directly abut the channel.

Floodwall ramps would have a similar impact, as discussed under Commercial Zones. Motorists and recreational viewers would pass by these locations quickly, and the ramps would not substantially alter available views or scenic vistas.

Applicable Best Management Practices

There are no District BMPs that directly relate to aesthetic resources. However, there are District BMPs that indirectly relate to aesthetic resources, which, applied before and during construction, would aid in lessening visual impacts associated with the built Project. The District would implement BMPs BI-10, BI-11, and BI-13, which indirectly relate to permanent alteration of aesthetics. Full text of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BI-10: Minimize Impacts to Vegetation Whenever Clearing (or Trimming) is Necessary

BMP BI-11: Minimize Root Impacts to Woody Vegetation

BMP BI-13: Plant Local Ecotypes of Native Plants and Choose Appropriate Erosion-Control Seed Mixes

Conclusion

In general, floodwalls in the Open Space Baylands Zone would create some visual disruption, particularly by acting as a visual barrier where none previously existed, and recreational viewers are expected to be highly sensitive to this change in visual quality associated with the views. However, because the floodwalls would be relatively short, these components would not substantially detract from the existing visual quality of the Open Space Baylands Zone. Potential impacts on visual and aesthetic resources from proposed floodwalls in the Open Space Baylands Zone are considered less than significant. Additionally, when constructing proposed floodwalls in the Open Space Baylands Zone, the District intends to use a concrete formliner that would result in a textured surface with approximately 2-inch vertical corrugated ribbing on both sides of the inboard and outboard floodwalls. This would provide visual interest and reduce glare over a flat wall surface.

In general, floodwalls would create some visual disruption in the Commercial and Residential Zones, particularly by acting as a visual barrier where none previously existed, and residential viewers are expected to be highly sensitive to this change in visual quality associated with the views. These components could detract from the existing visual quality of the Commercial and Residential Zones. However, with the implementation of the above BMPs, it is expected that Commercial and Residential Zones are likely to be minimally affected by floodwalls because of the limited amount of available views of the Project Area and similarity in the nature of Project components to existing features, where visible. Therefore, impacts in the Commercial and Residential Zones are considered less than significant.

Impact AES-3: Permanent Alteration of the Visual Character or Quality of the Project Area, Including Scenic Vistas, from Project Components other than Floodwalls – Less than Significant

Open Space Baylands Zone

Project components within the Open Space Baylands Zone other than floodwalls include bridge and culvert modifications, levee raising and enlargement, and levee and floodwall ramps. Maintenance roads throughout the Project Area would also be improved by resurfacing with gravel. The aesthetics of resurfaced maintained roads would not change.

Bridge and Culvert Modifications

The new bridge structure at Caribbean Drive would extend an additional 8 feet on both the upstream and downstream sides of the bridge crossing, and new sloped concrete wingwalls would also be constructed along both banks of the East Channel, at both the upstream and downstream sides of the bridge crossing. The new bridge structure at Carl Road would be the same length and slightly wider than the existing bridge crossing and would only be slightly taller, and new concrete wingwalls would replace the existing sacked concrete structures. These changes would not result in a substantial alteration to the existing visual quality or character of the Project Area because they are in keeping with existing visual conditions and would not introduce unfamiliar visual elements or greatly alter the scale of the existing bridges/culverts. These components would not detract from or alter available vista views.

Levee Raising, Enlargement and Ramps

Levee raising would occur at the northern Project extent on both Sunnyvale Channels, which would increase the height of the existing levee by 3.0–5.5 feet. The levee enlargement between Carl Road and Caribbean Drive would increase the height of the existing levee by approximately 5 feet, deepen to restore channel invert, and widen the levee base along the west bank to provide alternative emergency vehicle access to the existing City of Sunnyvale Wastewater Pollution Control Plant. These modified levees would be surfaced with aggregate rock and used by the District as channel maintenance roads, as currently occurs. The channel banks would be seeded for erosion control and re-vegetated with grasses, to restore the channels to their existing conditions. Levees are an existing visual element in the Open Space Baylands Zone, and once completed the levee raise and enlargement would incrementally increase the visibility of the levee, would not substantially alter the existing visual character, and would not affect vista views. The increased height of the levees would aid in allowing for slightly elevated views that would act to increase availability of vista views.

Levee Modifications

Levee ramps would ramp up from existing grade at Carl Road and Caribbean Drive to meet the new top of levee, described above. Motorists and recreational viewers would pass by these locations quickly, and the ramps would not substantially alter available views from Carl Road or Caribbean Drive.

Commercial Zone

Project components other than floodwalls within the Commercial Zone include bridge and culvert modifications, floodwalls, floodwall ramps, rock slope protection, wingwall and outfall bank stabilizations. Maintenance roads in some locations in the Project Area would also be improved by resurfacing with gravel or asphalt. The aesthetics of resurfaced maintained roads would not change. Commercial areas are likely to be minimally affected by the Proposed Project because of the limited amount of available views of the Project Area and similarity in the nature of Project components to existing features, where visible.

Bridge and Culvert Modifications

Bridge and culvert modifications that would occur in the Commercial Zone include W3, W4, E2, E3, and E5 (identified in Table 2-2 in Chapter 2, "Project Description"). Slightly larger bridge structures, new sidewalks, new driveway cuts, and raised headwalls would not result in a substantial alteration to the existing visual quality or character of the Project Area, because these components would maintain existing visual conditions and would not introduce unfamiliar visual elements or greatly alter the scale of the existing bridges/culverts. Existing Caribbean Drive westbound and eastbound bridges at Sunnyvale East Channel would be replaced with a triple cell reinforced box culvert (RCB) per the Proposed Project. The proposed RCB would match the existing Caribbean Drive profile which would avoid grading and infrastructure impacts to adjacent properties. No sidewalks currently exist along Caribbean Drive. The Proposed Project would construct sidewalks in compliance with City of Sunnyvale design standards. These components would not detract from or alter available vista views of the Santa Cruz Mountains, which are generally available when looking to the southwest from roadway crossings and along the channel corridors where maintenance roads are accessible and used for recreation.

Rock Slope Protection and Wingwall and Outfall Bank Stabilizations

Rock slope protection and wingwall and outfall bank stabilization would not substantially affect aesthetic resources at the Project Area. Grading associated with rock slope protection would be minimal to achieve a stable slope angle, exposed slopes would be hydroseeded, and grading would not greatly alter the appearance of the channels. Rock slope protection, concrete banks, and other hardened structures along the creek are already a visible and common element within the Sunnyvale Channels. Over time, it is anticipated that the rock would weather and vegetation would establish within rock

interstices, thus softening the appearances of such features. In addition, wingwall and outfall channel modifications would take place at existing structures and would only consist of installing small spans of concrete to prevent undermining of these components. Many of these improvements would not even be visible to viewers, but where they are visible such modifications would likely not draw a viewer's attention. However, the concrete spans would weather within a short period of time and these components would recede into the landscape.

Tree Removal

The majority of the land along the Sunnyvale channels currently lacks trees. Tree removal along both channels would be isolated to a few locations. The District anticipates that a total of 69 trees would be removed during construction of the Proposed Project (see Table 3.9-2 in Chapter 3.9, "Land Use and Planning"). All or most trees removed or otherwise affected by the Project would be located within the District's ROW or easements obtained as part of the Project. However, the Project may remove trees from Sunnyvale's public ROW, and in this case the Project has the potential to conflict with adopted measures for tree protection (see Chapter 3.9, "Land Use and Planning" for more details). The District would comply with the City's tree removal policy by planting and ensuring the establishment of at least one tree for each protected tree removed from the City's ROW. The biological impacts of tree removal are discussed in Chapter 3.3, "Biological Resources." A detailed discussion of tree removal in the commercial zone follows.

Removal of trees within the commercial zone of the East Channel northwest of Tasman Drive would not result in substantial impacts on aesthetic resources associated with the existing visual character or scenic vistas because a number of evergreen trees immediately adjacent to this tree would not be affected and visual access is not readily available to this location as the channel is fenced off from all adjacent locations.

Along the West Channel, approximately 10 trees would be removed between West Java Drive and Bordeaux Drive, and about four trees would be removed south of Ross Drive. Removal of trees along the West Channel occurs in locations where the areas between the commercial parking lots and the maintenance roads and channel are lined with existing trees and shrubs. The removal of the 10 trees between West Java Drive and Bordeaux Drive and four trees south of Ross Drive would be fairly spaced out and consist of one or two trees being removed at any one location, except in three locations where groupings of three to four trees would be removed. Also along the West Channel, a clustering of approximately 14 trees would be removed north of West Java Drive just north of the roadway and west of the channel. One individual tree would be removed a bit further downstream. Workers at this location would be more aware of the clustering of trees being removed because it is a larger grouping of trees. However, trees along the rest of this segment of channel would not be affected and passing motorists and workers would only have visual contact with this location for a short period of time. Workers

would be focused on tasks at hand, mostly within adjacent buildings, and would come into more direct visual contact upon entering and exiting the workplace. In addition, shrubs lining the parking lot would remain. Motorists passing the channel corridor would do so at 25 miles per hour on Bordeaux and Ross Drives and 45 miles per hour on West Java Drive would be focused on merging and turning traffic, and would be less likely to focus on finer details associated with the passing channel at these crossings.

Removal of these trees would not result in substantial impacts on aesthetic resources associated with the existing visual character and scenic vistas because pedestrians, workers, and motorists would be minimally affected; existing shrubs along the parking lot would remain; the remainder of trees along Sunnyvale Channels would not be affected.

Residential Zone

Project components other than floodwalls within the Residential Zone include bridge and culvert modifications, floodwalls, floodwall ramps, rock slope protection, wingwall and outfall bank stabilization, bench construction with rock, concrete-lined channel, and low-flow modifications. Maintenance roads throughout the Project Area would also be improved by resurfacing with gravel or asphalt in some locations. The aesthetics of resurfaced maintained roads would not change. Residential areas are likely to be minimally affected by the Proposed Project because of the limited amount of available views of the Project Area and similarity in the nature of Project components to existing features, where visible.

Bridge and Culvert Modifications

Bridge and culvert modifications that would occur in the Commercial Zone include E3, E4, and E6 (as identified in Table 2-2 in Chapter 2, "Project Description"). Raised headwalls would not result in a substantial alteration to the existing visual quality or character of the Project Area because they would be in keeping with the existing visual conditions and would not introduce unfamiliar visual elements or greatly alter the scale of the existing bridges/culverts. These elements would not detract from or alter available vista views of the Santa Cruz Mountains, which are generally available from roadway crossings and along the channel corridors.

Rock Slope Protection, Wingwall and Outfall Bank Stabilizations

As described for the Commercial Zone, rock slope protection and wingwall and outfall bank stabilization would not substantially affect aesthetic resources at the Project Area. Graded and hydroseeded slopes would not greatly alter the appearance of the channels. Rock slope protection, as well as concrete stream banks and other hardened facilities, is already a visible and common element along the Sunnyvale Channels. It is anticipated that the rock slope protection would weather over time and vegetation would establish within rock interstices, thus softening the appearances of such features. Wingwall and outfall channel modifications would not be very visible to viewers, but where they are

visible such modifications would also weather within a short period of time, and these components would recede into the landscape and would likely not draw a viewer's attention.

Bench Construction with Rock

Grading associated with the bench construction with rock would alter the East Channel banks between Hwy 101 and Blythe Avenue. However, visual access to this area is limited to the Blythe Avenue and East Ahwanee Avenue roadway crossings. Lattice steel transmission lines parallel the channel, and portions of this channel segment have concrete banks to protect the transmission towers. Grading the channel would not result in a substantial alteration of the visual character of the channel at this location or affect scenic vistas. Rock slope protection is already a visible and common element within the channels and, over time, the rock would weather and vegetation would establish within rock interstices, thus softening the appearances of such features.

Concrete Lined Channel

The concrete-lined channel, approximately 325 linear feet, would be visible from the eastern pathway within Fair Oaks Park. However, this segment of the East Channel already has sacked concrete banks, and the concrete-lined channel would be in keeping with the existing visual character of views at this site. The remaining portion of the East Channel along Fair Oaks Park is not visible to the public as the channel is contained/flows within an underground box culvert.

Tree Removal

Tree removal along the Sunnyvale Channels would be limited to a few locations along each channel and would not occur along the entire lengths of each channel. Along the residential zone of the East Channel, approximately six trees would be removed south of Tasman Drive and about 33 trees would be removed north of East Duane Avenue.

The six trees south of Tasman Drive are clustered around the base of the western transmission tower. Access to the channel from Tasman Drive is not available or authorized; however, there is an access point to the channel at this location via Tasman Court, south of the transmission tower. Motorists passing the channel corridor would pass at 40 miles per hour, would be focused on the upcoming curve, and would be less likely to focus on finer details associated with the passing channel at this crossing. The channel is mostly unvegetated at this location, and trees and shrubs lining Tasman Court and surrounding the base of the eastern transmission tower would remain. Therefore, removal of the vegetation surrounding the base of the western transmission tower would not substantially affect aesthetic resources associated with the existing visual character or scenic vistas at this location.

Removal of the 33 trees north of East Duane Avenue would occur along a portion of channel that is otherwise unvegetated. Vistas from the adjacent residential

neighborhoods are mostly obscured by fencing and utility line infrastructure from this vantage. Pedestrians using the sidewalks may take note of this loss of vegetation but would quickly become accustomed to it, because it is similar to the rest of the unvegetated portions of the channel at this location. Motorists passing the channel corridor would pass at 25–35 miles per hour, would be focused on merging and turning traffic, and would be less likely to focus on finer details associated with the passing channel at this crossing. Residents are the most likely to be affected by tree removal here, because they may receive some partial shading of their backyards from these trees. These residents, however, do have shrubs and trees in their backyards that already provide various levels of shading. Removal of these trees are within the District's ROW and would not result in substantial impacts on aesthetic resources associated with the existing visual character and scenic vistas because pedestrians and motorists would be minimally affected, and residential properties have existing shrubs and trees within their backyards.

Applicable Best Management Practices

There are no District BMPs that directly relate to aesthetic resources. However, there are District BMPs that indirectly relate to aesthetic resources that if applied before and during construction, would aid in lessening visual impacts associated with the built Project. The District would implement BMPs BI-10, BI-11, and BI-13, which indirectly relate to permanent alteration of aesthetics. Full text of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BI-10: Minimize Impacts to Vegetation Whenever Clearing (or Trimming) is Necessary

BMP BI-11: Minimize Root Impacts to Woody Vegetation

BMP BI-13: Plant Local Ecotypes of Native Plants and Choose Appropriate Erosion-Control Seed Mixes

Conclusion

As analyzed above, several Project components, including bridge and culvert modifications, levee raising and enlargement, levee and floodwall ramps, wingwall and outfall channel modifications, earthen bank with rock toe, and concrete-lined channel, would not substantially alter the visual character or quality of views associated with the Project Area and would not substantially affect scenic vistas. Therefore, impacts on aesthetic resources resulting from Project components other than floodwalls would be less than significant for the Open Space Baylands Zone.

Project Area Commercial and Residential Zones are likely to be minimally affected by the Proposed Project because of the limited amount of available views of the Project Area and similarity in the nature of Project components to existing features, where they

are visible. Therefore, impacts on aesthetic resources resulting from these Project components would be less than significant for the Commercial and Residential Zones.

Impact AES-4: Creation of a New Source of Light or Glare – Less than Significant

No new lighting would be installed under the Proposed Project. The bridge and culvert modifications, levee raising and enlargement, levee and floodwall ramps, rock slope protection, wingwall and outfall channel modifications, earthen bank with rock toe, and concrete lined channel components of the Project would modify or reconstruct existing features by using the same materials (e.g., rock, aggregate base rock for roads, soil material). The new or modified surfaces would not increase in size sufficiently to increase the amount of reflective surface area existing at any one given location. While new rock and concrete structures would appear lighter just after construction, their surfaces would weather within a short period of time. Vegetation would also establish within rock interstices and along levees, helping to reduce glare. Therefore, glare-related impacts associated with these Project components would not be substantial.

Depending on the design, floodwalls could potentially generate significant levels of glare owing to the color of the concrete or sheet piles, amount of available surface area, and lack of vegetative cover to filter sunlight reflecting upon the floodwall surfaces. However, glare is primarily generated by smooth surfaces and the proposed floodwalls would be constructed with a form liner to create a textured surface to minimize glare.

Applicable Best Management Practices

There are no District BMPs that directly relate to aesthetic resources and glare reduction. However, there are District BMPs that indirectly relate to aesthetic resources that if applied before and during construction, would aid in lessening visual impacts associated with glare. These include minimizing impacts on vegetation. Full text of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BI-10: Minimize Impacts to Vegetation Whenever Clearing (or Trimming) is Necessary

BMP BI-11: Minimize Root Impacts to Woody Vegetation

Conclusion

Levels of glare from bridge and culvert modifications, levee raising and enlargement, levee and floodwall ramps, rock slope protection, wingwall and outfall channel modifications, earthen bank with rock toe, and concrete-lined channel would be minimal for the Open Space Baylands, Commercial, and Residential Zones. Floodwalls could generate significant levels of glare. However, the surface of the floodwalls would be textured with form liners to minimize glare. Therefore, impacts on light and glare resulting from the Proposed Project would be less than significant.

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Chapter 3.2

Air Quality

3.2.1 Introduction

This chapter summarizes the potential air quality impacts related to implementation of the Proposed Project. Included is a description of the regulatory and environmental setting of the Project Area. An analysis of air quality impacts from Project construction is then presented. Where feasible, mitigation measures are identified to reduce the level of expected impacts.

3.2.2 Regulatory Setting

Federal Regulations

Clean Air Act

The U.S. Environmental Protection Agency (EPA) carries out the provisions of the federal Clean Air Act (CAA), originally passed in 1963 and amended six times, most recently in 1990. EPA implements programs under the CAA that focus on reducing ambient air pollutant concentrations, reducing emissions of toxic pollutants, and phasing out production and use of chemicals that destroy stratospheric ozone. EPA sets allowable ambient air concentrations, codified as the National Ambient Air Quality Standards (NAAQS), for six criteria pollutants: particulate matter, carbon monoxide, nitrogen oxides, sulfur oxides, ground-level ozone, and lead. The NAAQS are presented in **Table 3.2-1**. Primary standards are set for protection of human health and secondary standards are set for environmental protection. Areas that meet the primary standards are considered to be in “attainment,” while areas with air quality not meeting the primary standards are in “nonattainment.”

Of the six criteria pollutants, particulate matter—PM₁₀ (particulates less than or equal to 10 microns in diameter) and PM_{2.5} (particulates less than or equal to 2.5 microns in diameter)—and ground-level ozone pose the most widespread threat to human health. Particulate matter includes very fine soot and dust. Particulate matter pollution comes from a number of sources, including fossil fuel combustion (e.g., motor vehicles), wood burning, industrial operations, and ground-disturbing activities. Particulate matter pollution can be carried by the wind and impair air quality far from its source. It poses the greatest threat to sensitive receptors, including children, the elderly, and asthmatics. To reduce particle levels, EPA regulates emissions from motor vehicles and point sources.

Table 3.2-1. State and Federal Ambient Air Quality Standards

Contaminant	Averaging Time	State Standards ^a	Primary Federal Standards ^b	Secondary Federal Standards ^b
Ozone	1 hour	0.09 ppm	–	–
	8 hour	0.070 ppm	0.075 ppm	0.075 ppm
Respirable Particulate Matter (PM ₁₀)	24 hour	50 µg/m ³	150 µg/m ³	Same as primary standard
	Annual arithmetic mean	20 µg/m ³	–	–
Fine Particulate Matter (PM _{2.5})	24 hour	–	35 µg/m ³	Same as primary standard
	Annual arithmetic mean	12 µg/m ³	12 µg/m ³	Same as primary standard
Carbon Monoxide	8 hour	9.0 ppm	9 ppm	None
	1 hour	20 ppm	35 ppm	None
Nitrogen Dioxide	Annual arithmetic mean	0.030 ppm	0.053 ppm	Same as primary standard
	1 hour	0.18 ppm	0.1 ppm	None
Sulfur Dioxide	24 hour	0.04 ppm	–	–
	3 hour	–	–	0.5 ppm
	1 hour	0.25 ppm	75 ppb	–
Lead ^c	30-day average	1.5 µg/m ³	–	–
	Calendar quarter	–	1.5 µg/m ³	Same as primary standard
Visibility-reducing particles	8 hour	0.23/km	–	–
Sulfates	24 hour	25 µg/m ³	–	–
Hydrogen Sulfide	1 hour	0.03 ppm	–	–
Vinyl Chloride ^c	24 hour	0.01 ppm	–	–

Notes: µg/m³ = micrograms per cubic meter, CARB = California Air Resources Board, PM_{2.5} = particulate matter less than 2.5 microns in diameter, PM₁₀ = particulate matter less than 10 microns in diameter, ppb = parts per billion by volume, ppm = parts per million by volume

^a California standards for ozone, carbon monoxide, sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, particulate matter (PM₁₀ and PM_{2.5}), and visibility-reducing particles are values that are not to be exceeded. The standards for sulfates, lead, hydrogen sulfide, and vinyl chloride are not to be equaled or exceeded.

^b National standards other than for ozone, particulates, and those based on annual averages are not to be exceeded more than once per year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM₁₀, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m³ is equal to or less than one. For PM_{2.5}, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard.

^c CARB has identified lead and vinyl chloride as “toxic air contaminants” with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

Source: CARB 2012.

Ground-level ozone is the primary component of smog. Ozone is formed from the interaction of reactive organic gases (ROGs) and nitrogen oxides (NOx). Motor vehicles, industrial activities, and such consumer products as paints, inks, and adhesives emit ROGs. The combustion of gasoline, coal, and oil emits NOx. Weather and topography influence the formation and location of ground-level ozone. Hot temperatures spur the reaction between ROGs and NOx to form ozone. Sensitive receptors to ozone are the same as those for particulate matter. Ground-level ozone settles into valleys when winds are calm and temperatures are warm.

State Regulations

California Air Resources Board

The California Air Resources Board (CARB) was established in 1967. CARB has set California Ambient Air Quality Standards (CAAQS), presented above in Table 3.2-1, which are more stringent than the NAAQS for most contaminants. These include standards for additional contaminants not covered in the NAAQS, including visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride. The California Clean Air Act was passed in 1988 and requires nonattainment areas to achieve and maintain the CAAQS by the earliest time practicable, and local air districts to develop attainment plans for state standards. CARB regulates motor vehicle emissions in the state, while local air quality management districts permit stationary sources.

Local Regulations

Bay Area Air Quality Management District

The Bay Area Air Quality Management District (BAAQMD) is the primary agency that regulates sources of air pollution in the nine San Francisco Bay Area (Bay Area) counties to achieve and maintain air quality standards for all criteria pollutants. BAAQMD prepares plans for attaining and maintaining air quality standards, adopts and enforces rules and regulations, issues air quality permits for equipment that emits air pollutants, and monitors air quality and meteorological conditions.

BAAQMD 2010 Clean Air Plan

BAAQMD adopted the Bay Area Clean Air Plan (Bay Area CAP) in 2010 to provide a plan to improve Bay Area air quality and meet public health goals. More specifically, the control strategy described in the Bay Area CAP is designed to reduce emissions and decrease ambient concentrations of harmful pollutants, safeguard public health by reducing exposure to air pollutants that pose the greatest health risk, and reduce greenhouse gas (GHG) emissions to protect the climate.

The Bay Area CAP addresses four categories of pollutants: (1) ground level ozone and its key precursors, ROG and NOx; (2) particulate matter, primarily PM_{2.5}, as well as

precursors to secondary PM_{2.5}; (3) air toxics; and (4) GHGs. The control strategy in the Bay Area CAP describes stationary source measures, transportation control measures, mobile source measures, land use and local impact measures, energy and climate measures, and further study measures to reduce air pollutants (BAAQMD 2010a).

Particulate Matter Plan

To fulfill federal air quality planning requirements, the BAAQMD adopted a PM_{2.5} emissions inventory for year 2010 at a public hearing on November 7, 2012. This was transmitted to CARB for inclusion in the California State Implementation Plan. An informational report entitled "Understanding Particulate Matter: Protecting Public Health in the San Francisco Bay Area". This is an informational item that will help guide BAAQMD's on-going efforts to analyze and reduce PM in the Bay Area. Several measures for reducing PM emissions in the Bay Area were detailed in the multi-pollutant approach contained in the Bay Area CAP.

BAAQMD 2001 Ozone Attainment Plan

BAAQMD adopted the Bay Area Ozone Attainment Plan in 2001 in response to EPA's finding of failure of the Bay Area to attain the national ambient air quality standard for ozone. The Plan includes a control strategy for ozone and its precursors to ensure reduction in emissions from stationary sources, mobile sources, and the transportation sector.

BAAQMD CEQA Guidelines

The BAAQMD has developed CEQA guidelines and thresholds of significance to assist local jurisdictions in evaluating potentially adverse impacts on air quality. The most recent CEQA guidelines were updated in 2012 (BAAQMD 2012a) and the most recent thresholds were adopted in 2010. BAAQMD's adoption of the 2010 thresholds of significance (2010 Thresholds) was challenged in court (*California Building Industry Association v. Bay Area Air Quality Management District*, Superior Court Alameda County, March 5, 2012, No. RG10-548693), but a First District Court of Appeal ruling recently affirmed the agency's adoption of the thresholds (218 Cal. App. 4th 1171, August 13, 2013), finding that they were adopted based on substantial evidence and their adoption is not subject to CEQA review.

The thresholds of significance for the air quality analysis in this EIR are discussed further in Section 3.2.4, below.

City of Sunnyvale General Plan

The following policy contained in the *Sunnyvale General Plan* (City of Sunnyvale 2011) is relevant to the Proposed Project:

Air Quality

Goal EM-11 Improve Sunnyvale's air quality and reduce the exposure of its citizens to air pollutants.

3.2.3 Environmental Setting

Climate and Topography

Climate and topography are the main factors that dictate the potential for air pollution to build up or concentrate in an area. Air quality measured at a particular time is a function of the air pollution potential and existing emissions at a given time. Wind speed, inversions, atmospheric stability, solar radiation, and topography all influence the potential for air pollution. Wind speed affects air quality because low wind speeds allow for a buildup of pollutant concentrations, while faster wind speeds carry pollutants away from a source. Inversions occur when a layer of warm air rests over a cool layer, which can trap pollutants and lead to greater concentrations and poor air quality. Atmospheric stability, or the atmosphere's resistance to vertical motions, can influence the ability of pollutants to move vertically. Atmospheric stability is dependent on temperature gradients; strong decreases in temperatures moving vertically can decrease atmospheric stability and increase the mixing of pollutants. Solar radiation contributes to the formation of ozone. Sunny, hot days in the Bay Area in the summer promote ozone formation, particularly in inland areas with higher temperatures. Topography influences air pollution through wind and circulation patterns. The side opposite the prevailing wind (lee) can be sheltered from predominant winds, reducing turbulence and downward transport of pollutants (BAAQMD 2010b).

Santa Clara Valley Subregion

The Proposed Project is located in the SFBAAB. The BAAQMD divides the SFBAAB into subregions with distinct climate and topography. The City of Sunnyvale is in the Santa Clara Valley, which is bounded by the Santa Cruz Mountains to the west, the Diablo Range to the east, the San Francisco Bay to the north, and the convergence of the Gabilan and Diablo Ranges to the south. The terrain of the Santa Clara Valley is the main influence on wind patterns, resulting in a prevailing flow roughly parallel to the valley's northwest-southeast axis. A north-northwesterly sea breeze blows up the valley during the afternoon and early evening, and a light south-southeasterly wind during the later evening and early morning (the "valley wind" situation, where colder dense air from overnight descends in elevation). The strongest winds typically occur in the summer afternoons and evenings. Santa Clara Valley has a high air pollution potential because of the valley's large population; the transport of photochemical precursors from surrounding counties to the valley area; and the concentration of pollutants that occurs in the valley from the boarding mountains, winter inversions, and low-inversion summer days (BAAQMD 2010c).

Air Quality Attainment Status and Local Conditions

The attainment status of state and federal standards in the SFBAAB (in which the Proposed Project is located) is shown below in **Table 3.2-3**. The SFBAAB, including Santa Clara Valley, is in attainment under state standards for carbon monoxide, nitrogen dioxide, sulfur dioxide, and sulfates. The SFBAAB is in nonattainment under state standards for ozone, PM₁₀, and PM_{2.5}. Under federal standards, the SFBAAB is in nonattainment for 8-hour ozone and 24-hour PM_{2.5} (BAAQMD 2012b). Within the City of Sunnyvale, the largest source of air quality pollutants comes from vehicles on local roads, especially during peak commute hours (City of Sunnyvale 2011).

Table 3.2-2. SFBAAB State and Federal Standards Air Quality Attainment Status

Contaminant	Averaging Time	State Standards Attainment Status	Federal Standards Attainment Status
Ozone	1 hour	N	-
	8 hour	N	N
Respirable Particulate Matter (PM ₁₀)	24 hour	N	U
	Annual arithmetic mean	N	-
Fine Particulate Matter (PM _{2.5})	24 hour	-	N
	Annual arithmetic mean	N	A
Carbon Monoxide	1 hour	A	A
	8 hour	A	A
Nitrogen Dioxide	1 hour	A	U
	Annual arithmetic mean	-	A
Sulfur Dioxide	1 hour	A	A
	24 hour	A	A
	Annual arithmetic mean	-	A
Lead	30-day average	-	A
	Calendar quarter	-	A
Visibility-reducing particles	8 hour	U	-
Sulfates	24 hour	A	-
Hydrogen Sulfide	1 hour	U	-
Vinyl Chloride ^c	24 hour	-	-

Notes: A= Attainment, N= Nonattainment, U= Unclassified

Source: BAAQMD 2012b.

3.2.4 Impact Analysis

Criteria for Determining Significance

For the purposes of this analysis, the Proposed Project would result in a significant impact on air quality if it would:

- a) Conflict with or obstruct implementation of the applicable air quality plan;
- b) Exceed any air quality standard by failing to adhere to assumptions used in the preparation of any Air Quality Plans;
- c) Result in an cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors);
- d) Expose sensitive receptors to substantial pollutant concentrations; or
- e) Create objectionable odors affecting a substantial number of people.

Significance Thresholds

Table 3.2-2 below lists the BAAQMD 2010 Thresholds for criteria air pollutants from construction-related emissions, upon which this analysis used to determine the significance of air quality impacts for the Proposed Project.

Table 3.2-3. BAAQMD Construction Air Quality Thresholds of Significance

Pollutant	Average Daily Emissions (pounds per day)
ROG	54
NOx	54
PM ₁₀ (Exhaust)	82
PM _{2.5} (Exhaust)	54
PM ₁₀ /PM _{2.5} (Fugitive Dust)	Best Management Practices (BMPs)
Local CO	None
Accidental Release of Acutely Hazardous Air Pollutants	None
Odors	None

Source: BAAQMD 2010b.

Methodology

The Proposed Project would generate emissions of air pollutants and potentially odors from construction activities. No new operational sources of emissions would be generated by the Project. After the Project is constructed, Project maintenance would occur as needed and would require periodic use of smaller equipment. However, this EIR does not evaluate Project maintenance activities, because they were previously evaluated in the District's Stream Maintenance Program Subsequent EIR (refer to Chapter 2.0, "Project Description"). The Stream Maintenance Program Subsequent EIR is available for review online: <http://valleywater.org/SMPSEIR2011.aspx>. See Volume 2, Chapter 3, Section 3.2 of that document for the Air Quality impact discussion.

Because operational emissions are not evaluated in this EIR, as they were previously analyzed in the Stream Maintenance Program Subsequent EIR, no thresholds for annual emissions are presented. The thresholds of significance for construction emissions are based on an average daily value.

Emissions Calculations

Emissions from construction of the Proposed Project were estimated using the Road Construction Emissions Model (Model) (Version 7.1.3, developed by Sacramento Metropolitan Air Quality Management District). The Model estimates emissions from Project construction activities, including: soil hauling, on-road worker commute vehicle trips, water truck use, fugitive dust, and use of various types of off-road construction equipment.

The use of off-road construction equipment covers the use of air hoses and compressors, backhoes, concrete trucks, cranes, dump trucks, drum rollers, excavators, flatbed boom trucks, flatbed trucks, front end loaders, graders, pavers, tractors/dozers, traffic control message boards, vibratory rollers, and water trucks. All Project construction activities would be completed using these types of off-road construction equipment. For a complete overview of the types of construction equipment used for different construction activities, refer to Table 2-4 in Chapter 2, "Project Description."

The Model utilizes CARB's EMFAC2011, CARB's official model for estimating emissions from on-road cars and trucks and the OFFROAD2007 and OFFROAD2011 models, which calculate emissions from off-road construction equipment. The Model estimates the average daily emissions of ROG, carbon monoxide (CO), NO_x, PM₁₀, and PM_{2.5} throughout the different phases of construction. Two separate but overlapping construction timeframes were established based on the types of construction crews that would complete Project construction activities. One timeframe covered the out-of-channel work (floodwalls, maintenance road, and bridge reconstruction crews). The other covered the in-channel work (rock slope protection, wing walls, concrete lining, sediment removal, and culvert replacements crews). **Table 3.2-4** below outlines the construction timeframe for

each crew type, including the Project components constructed and the construction season and 2-year construction period.

Table 3.2-4. Construction Crew Information Used for Air Quality Modeling

Crew Type	Annual Construction Season	2-Year Construction Period (months)	Project Components Constructed
Out-of-channel Crews*	May 1 st to November 30 th	14 months	Floodwalls, floodwall ramps, levee modifications, fencing, and maintenance road modifications
In-channel Crew	June 1 st to October 31 st	10 months	Channel excavation, rock slope protection, wing walls, sediment removal and bridge/culvert modifications

* The out-of-channel work could occur year-round (January 1 – December 31); however, because out-of-channel work is likely to be infeasible during the rainy season due to muddy conditions, conservative assumptions were made regarding the duration of construction for the purpose of emissions calculations (May 1 – November 30).

The following methodology was used to estimate Project construction emissions:

- Table 2-4 (in Chapter 2, “Project Description”) lists the types of construction equipment that would be used for construction activities of each Project component, which formed the basis of the Model inputs.
- The duration of use for each type of construction equipment was estimated, then divided over the entire 14-month construction period to determine the average daily use during the construction period. This will result in the average daily emission rate over the total construction duration.
- Construction was assumed to occur only during the work week, lasting up to 8 hours per day.
- The Model used estimates of the hourly use per day of all pieces of construction equipment. Certain pieces of equipment, such as traffic control message boards and water trucks, would be used the entire 8-hour day during construction. Other pieces of construction equipment, depending on their use and the specific activity, would run for only a fraction of the day. For example, concrete trucks would be used 7 hours a day during bridge replacement, but only 2 hours a day during concrete sidewalk installation. It was conservatively assumed that all equipment operates for a full 8-hours per day. Estimates of the hours and number of days each type of construction equipment is used for different construction activities are provided in **Appendix G**.
- The Model also conservatively assumed a work area buffer of 60 feet (an average channel width of 10 feet, with a 25-foot work area on either side of the channel) to encompass all construction activities along the Channels. The work area buffer affects the amount of fugitive dust and particulate matter generated by the Model.

- Multiple crews would construct Project components concurrently on both Sunnyvale Channels and at the Caribbean Drive crossing of the East Channel. The in-channel and road crews were assumed to have a total of 33 workers. The floodwalls and concrete crews and the Caribbean Drive bridge reconstruction crew were also assumed to have a combined total of 33 workers.
- To estimate worker commute emissions, each worker was assumed to travel 20 miles each way to and from the construction site each day.

Table 3.2-5 summarizes estimates of average daily emissions for all construction crews. Because the two crew types would work concurrently, the emissions calculations were performed by grouping the two crew types together since they overlap in time. Two scenarios are presented to indicate the potential overlap. The 14-month scenario represents a reasonable value if all construction were to occur over a total duration of 14 months. The 10-month scenario represents the conservative assumption that all work would be completed in 10 months. **Appendix G** presents detailed emissions calculations. The impacts associated with odors from the Proposed Project were assessed qualitatively based on local soil conditions.

The term “sensitive receptors” is used in this section and refers those who are particularly susceptible to the adverse effects of air pollution.

Table 3.2-5. Estimated Average Daily Emissions from Project Construction Activities

Emissions Source	Average Daily Emissions (average pounds per day)						
	ROG	CO	NOx	Exhaust		Fugitive Dust	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Construction Crews (Scenario 1: 14-month duration)	9.0	54.5	78.5	4.5	4.0	20.0	4.2
All Construction Crews (Scenario 2: 10-month duration)	11.5	68.9	104.4	5.9	5.2	20.0	4.2
Threshold of Significance	54	None	54	82	54	BMPs	BMPs

*The two scenario values are not additive. The 14-month scenario represents a reasonable value if all construction were to occur over a total duration of 14 months. The 10-month scenario represents the conservative assumption that all work would be completed in 10 months. In practice, construction would be most intense during June through October, and less intense during May and November; total daily emissions would fall somewhere between the two scenario values.

Environmental Impacts

The impact discussions below are structured as follows. First, the environmental impacts of the Proposed Project in the absence of BMPs are discussed. The discussion then presents applicable District BMPs that would avoid or minimize the level of impact. A conclusion regarding the significance of the environmental impact is then made (considering implementation of the District BMPs, as applicable). If the impact would be significant even with use of BMPs, mitigation measures (MMs) are prescribed. The residual significance of each impact following application of the MMs is then provided.

Impact AIR-1: Conflict with or Impair Implementation of Applicable Air Quality Plans – Less Than Significant

The Proposed Project would be considered to have a significant impact if it would conflict with or impair implementation of applicable air quality plans. Applicable air quality plans include: Bay Area 2001 Ozone Attainment Plan, Bay Area 2010 Clean Air Plan, and City of Sunnyvale General Plan.

The Bay Area 2001 Ozone Attainment Plan includes a control strategy that includes stationary source, mobile source, and transportation measures to reduce ozone and ozone precursors. The Bay Area 2010 Clean Air Plan includes a control strategy that includes stationary source, mobile source, transportation control, land use and local impact, energy and climate, and additional measures to control ozone and its precursors (ROG and NO_x), PM₁₀, PM_{2.5}, and TACs. The City of Sunnyvale General Plan has a policy that aims to improve the air quality of the City.

Applicable Best Management Practices

There are no District BMPs applicable to this impact.

Conclusion

The Proposed Project would not include activities covered in the Bay Area 2010 Clean Air Plan or the Bay Area 2001 Ozone Attainment Plan. The Proposed Project would involve temporary construction emissions, would not result in induced growth, and would not result in a permanent new source of emissions. The Proposed Project would lead to land uses that are consistent with those anticipated in the City of Sunnyvale General Plan for long-range air quality planning, and would not facilitate further growth. Therefore, the Proposed Project would not conflict with an applicable air quality plan.

Impact AIR-2: Exceed Any Air Quality Standard by Failing to Adhere to Assumptions Used in the Preparation of any Air Quality Plans – Less Than Significant

The Proposed Project would be considered to have a significant impact related to exceedance of air quality standards if it failed to adhere to assumptions used in the preparation of air quality plans. As described above under Impact AIR-1, the Proposed Project would conform to all applicable air quality plans. In addition, as described below under Impact AIR-3, the Project would not contribute to the exceedance of air quality standards.

Applicable Best Management Practices

There are no District BMPs applicable to this impact.

Conclusion

The Project would not contribute to exceeding air quality standards by failing to conform to applicable air quality plans. This impact would therefore be less than significant.

Impact AIR-3: Result in a Cumulatively Considerable Net Increase of any Criteria Pollutant for Which the Project Region is Non-Attainment – Significant and Unavoidable

Project construction activities would require daily use of construction equipment and vehicles powered by diesel and gasoline fuel, the combustion of which would emit criteria air pollutants, including ROG, CO, and exhaust-based PM₁₀, and PM_{2.5}. In addition, Project ground-disturbing activities would release fugitive dust emissions of fine particulate matter – both PM₁₀ and PM_{2.5}.

As shown in Table 3.2-2 above, the Proposed Project would be considered to have a significant temporary (construction-related) impact on increased criteria pollutants if it would increase emissions of ROG, NOx, or PM_{2.5} from exhaust by 54 lb/day, or emissions of PM₁₀ from exhaust by 82 lb/day. There are no numerical thresholds for fugitive-dust-based PM₁₀ and PM_{2.5}. However, implementation of BMPs recommended by BAAQMD would ensure that the levels of emissions of fugitive-dust-based PM₁₀ and PM_{2.5} would be below significance.

Applicable Best Management Practices

The District would implement the following BMPs during construction of the Project to ensure dust management and thereby control fugitive dust emissions. BMP AQ-1 would require implementation of BAAQMD best management practice for dust suppression; BMP AQ-2 would minimize dust from larger construction areas; and BMP AQ-3 would require implementation of optional BAAQMD dust control measures. The full text of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP AQ-1: Use Basic Dust Control Measures for All Construction Sites

BMP AQ-2: Use Enhanced Dust Control Measures for Sites Greater than Four Acres in Size

BMP AQ-3: Incorporate Additional Dust Control Measures, As Appropriate

Conclusion

As demonstrated in the emissions calculations presented in Table 3.2-5 and **Appendix G**, the Proposed Project would result in construction emissions of NO_x above the Thresholds. All pollutants except NO_x are less than the Thresholds. These construction emissions will not be permanent and will not contribute to emissions once construction of the Proposed Project is complete. They will however contribute to the air quality during the construction period. As a consequence, this impact is considered significant.

The following mitigation measures will be implemented to reduce NO_x emissions from construction equipment.

Mitigation Measure AQ-1: Restrict Construction Equipment Idling Times

Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes. Clear signage shall be provided for construction workers at all access points.

Mitigation Measure AQ-2: Construction Equipment Maintenance

All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications.

Mitigation Measure AQ-3: Use of Efficient Construction Equipment

The project shall utilize to the extent feasible construction equipment that would reduce emissions including the use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, add-on devices such as particulate filters. The construction equipment should be at least as efficient as the fleet average estimated for 2014 from CARB's OFFROAD 2011.

The mitigation measures proposed would reduce the amount of NO_x emissions associated with construction of the Proposed Project. However, it is not feasible to reduce the NO_x emissions below an average of 54 pounds per day. As a consequence, this impact is considered significant and unavoidable.

Impact AIR-4: Expose Sensitive Receptors to Substantial Pollutant Concentrations – Less Than Significant

The Proposed Project would be considered to have a significant impact on sensitive receptors if it would result in release of toxic air contaminants (diesel particulate matter and volatile organic compounds) that would cause an increased cancer risk by 10 in 1,000,000, non-cancer chronic risk by 10.0 Hazard Index, or increase PM_{2.5} concentrations above 0.8 micrograms/m³ on an annual average basis within a zone of influence that includes a 1,000-foot radius around the Project property lines (BAAQMD, 2010b). The Proposed Project would also be considered to have a significant local impact if it would include long-term storage of acutely hazardous materials near sensitive receptors. Finally, the Proposed Project would be considered to have a significant local impact if it would increase local long-term CO concentrations by 9.0 ppm (8-hour average) or 20.0 ppm (1-hour average).

Sensitive Receptors

Commercial businesses are located all along the West Channel and along the East Channel between Caribbean Drive and SR 237. However, workers at commercial business would typically stay indoors during work hours and only stay outside temporarily when coming to and leaving work and possibly during work breaks, and are therefore not considered sensitive receptors.

Several authorized and unauthorized outdoor recreational uses occur within 1,000-feet of some portions of the Proposed Project (see Figure 3.11-1 and Chapter 3.11, "Recreation"). Recreational users within 1,000 feet of Project activities are expected to be exposed infrequently for very short periods of time. While they could be exposed to inhalable emissions generated by Project activities, they would not be exposed for long durations. Nonetheless, because of their proximity to Project activities, they are considered sensitive receptors.

No residential areas are located within 1,000 feet of the West Channel. Residential areas are located as close as 50–75 feet from the top of the channel banks all along the East Channel upstream/south of SR 237. These residential areas primarily include medium-density homes, as well as schools, elder care facilities, and hospitals. Residents are expected to commonly be outside, within front and back yards or walking around neighborhoods, especially during summer months when more people are typically outside and the Project would be constructed. Residents, schools, elder care facilities, and hospitals within 1,000 feet of the Project are considered sensitive receptors.

The assessment of cancer and chronic non-cancer health risk is typically based on a 70-year exposure period. Construction activities are sporadic, transitory, and short-term in nature, and therefore emissions from these activities share these characteristics. There is considerable uncertainty in trying to evaluate the cancer risk from projects that will only last a small fraction of a lifetime (OEHHA 2012). Similarly, the PM_{2.5} threshold is based on an annual average increase. The duration construction is up to 14 months over a 2-year period. Local exposure to toxic air contaminants from vehicle fueling and from PM_{2.5}

emissions would be temporary, and exposure of sensitive receptors would be well below the 70-year exposure period and would not result in a new, long-term source of emissions.

Similarly, the Project would not result in a new, long-term source of CO emissions, and would therefore not have the potential to exceed the operational threshold for CO.

Project construction would involve temporary storage of hazardous materials including fuels and lubricants, but it would not include long-term storage of any hazardous materials. The Project would not include the use or storage of any acutely hazardous materials. The Project could result in the removal of VOCs in local soil and groundwater depending on the results of a Phase II Environmental Site Assessment (see Chapter 3.7, "Hazards and Hazardous Materials"). However, the removal and appropriate disposal of any VOCs would represent a benefit to local air quality and sensitive receptors in the immediate vicinity of the Project.

Applicable Best Management Practices

There are no District BMPs applicable to this impact.

Conclusion

Local exposure of sensitive receptors to Project construction emissions would be temporary, and the Project would not result in a new, long-term source of emissions. In addition, Project construction would not involve long-term storage of acutely hazardous materials. This impact is therefore considered to be less than significant.

Impact AIR-5: Create Objectionable Odors Affecting a Substantial Number of People – Less Than Significant

The Proposed Project would be considered to have a significant odor-related impact if it would expose a substantial number of people to objectionable odors.

Soil core samples from borings taken during geotechnical investigations of the Project Area were found to contain organic material. The northern portion of the Sunnyvale Channels underlain by Bay Mud has a high organic content. Alluvial fan deposits in the Sunnyvale Channels upstream of the area with Bay Mud also contain organic material along with silty clays. The natural decomposition of organic material below the ground surface leads to anaerobic conditions and the production of hydrogen sulfide. When the sediment is excavated or disturbed, hydrogen sulfide gas might then be released. While the concentrations of hydrogen sulfide gas would not be substantial enough to adversely affect human health, they could cause an annoyance by creating an objectionable odor.

Sediment containing high levels of organic material could be exposed during ground-disturbing and excavation activities associated with Project construction. This includes excavation from channel easements for floodwalls and excavation from within the channel for bridge reconstruction, rock slope protection, and sediment removal to increase channel

capacity. These activities would commonly require stockpiling of soil, either for reuse on-site or export off-site. No soil would be imported for the Project. These activities would occur briefly at any Project location, lasting from a couple of days up to couple of months.

The intensity of the odor to a receptor depends on the distance of the receptor from the construction activity and the amount and quality of sediment exposed. The location of Project construction activities would be limited to the Project Work Area which includes the District's existing right-of-way/easements and property permanently and temporarily acquired for the Project (refer to Figures 2-3a through 2-3g in Chapter 2, "Project Description"). Excavation activities and stockpiling of soil would be limited to the Project Work Area.

No receptors are permanently located within the Project Work Area. Persons travelling in vehicles over channel roadway crossings are not considered receptors to odors because they would only very briefly be exposed to any odors as they pass over the channel crossings. However, receptors to odors are located near the Project Work Area, including residents, recreational users, students and staff at nearby schools, and people working at commercial businesses.

Sensitive receptors in the Project vicinity are described under Impact AIR-4 and include residents, schools, elder care facilities, and hospitals within 1,000 feet of the Project.

Applicable Best Management Practice

The District would implement the following BMP during Project construction to ensure dust management and thus control fugitive dust emissions.

BMP AQ-4: Avoid Stockpiling Potentially Odorous Materials

BMP AQ-4 would ensure minimal exposure of residences to odorous soil by avoiding stockpiles within 1,000 feet of residences. The full text of this BMP is provided in Table 2-8 in Chapter 2, "Project Description."

Conclusion

Sensitive receptors to odors from soil excavated during the Project are limited to residents, schools, elder care facilities, and hospitals along the East Channel upstream/south from SR 237. Implementation of BMP AQ-4 would prevent stockpiling of odorous soil within 1,000 feet of residences along the East Channel. Because of the close proximity of residences to the East Channel, no long-term stockpiling of odorous soils would occur upstream of approximately SR 237. Any odorous soil excavated from these areas would be transported away in accordance with all federal, state, and local laws, regulations, etc. having jurisdiction. Thus, any exposure to residences would be minimized and very brief. For these reasons, this impact is considered less than significant.

Chapter 3.3

BIOLOGICAL RESOURCES

3.3.1 Introduction

This chapter describes the biological resources setting of the Sunnyvale Channels Project Area. To identify existing biological conditions in the Project Area, a number of information sources were reviewed. Sources included the following:

- 2011 District Stream Maintenance Program (SMP) Update FEIR (SCVWD 2011); the SMP Update Biological Assessments for the U.S. Fish and Wildlife Service (USFWS; H. T. Harvey & Associates 2011a) and National Marine Fisheries Service (NMFS; H. T. Harvey & Associates 2011b); the California Endangered Species Act (CESA) Incidental Take Permit application for the SMP Update (H. T. Harvey & Associates 2011c);
- *Habitat Assessment for Listed and Fully Protected Special-Status Species and the Preliminary Delineation of Wetland and Other Waters for the Sunnyvale East and West Channels Flood Protection Project* (H. T. Harvey & Associates 2011d, 2013); the *Final Baseline Biological Conditions Report for the Sunnyvale East Channel and Sunnyvale West Channel Flood Protection Project* (EDAW 2007a);
- H. T. Harvey & Associates reports prepared for the South Bay Salt Ponds Restoration Project and projects on the Guadalupe River, Guadalupe Slough, and Coyote Creek as they pertained to certain species;
- *Breeding Census for the California Clapper Rail (*Rallus longirostris obsoletus*) at Naval Air Station Moffett Field and Guadalupe Slough* (USFWS 1992); the California Clapper Rail Breeding Survey, South San Francisco Bay (H. T. Harvey & Associates 1989); a variety of data on special-status species occurrences compiled by the District since 2001; Rarefind data (California Natural Diversity Database [CNDDDB] 2013); the Breeding Bird Atlas of Santa Clara County (Bousman 2007a); California Bird Species of Special Concern (Shuford and Gardali 2008); unpublished records of bird observations in the Project Vicinity (Santa Clara County Bird Data, unpublished); and bird records from the Project Vicinity reported to the South Bay Birds list-serve (<http://groups.yahoo.com/group/south-bay-birds>) and reported on eBird (2013).
- California Native Plant Society (CNPS) lists (<http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi>) and applicable records were also consulted to determine the potential for occurrence of special-status plant species in the Project Area.

The *Jepson Manual, second edition* (Baldwin et al. 2012) supplied information regarding the distribution and habitats of vascular plants in Santa Clara County.

Surveys and Monitoring Performed by the District

Surveys for biological resources, including special-status species, have been conducted in the Project Area as part of the District's planning efforts for the Sunnyvale Channels Project (e.g., EDAW 2007a, H. T. Harvey & Associates 2011a, 2011b, 2011c). Surveys have also been conducted in support of the Pond A4 restoration project (e.g., SCVWD 2001), and as part of the SMP (e.g., SCVWD 2008, EDAW 2008), which requires the assessment of habitat suitability for special-status species prior to the implementation of stream maintenance activities. The discussion below summarizes previous surveys and monitoring efforts that were used in developing the environmental setting (discussed in Section 3.3.3, below) for the Proposed Project.

Vegetation Mapping

In 2010, Aerial Information Systems, Inc. (AIS) conducted vegetation mapping of the portion of the Project Area south of Pond A4. Vegetation units were mapped using aerial photo interpretation and interactive computer digitization methods. The vegetation classification system was based on *A Manual of California Vegetation* (Sawyer et al. 2009). Each vegetation unit was coded to the group level (alliance level where possible) and assigned a cover class density for the vegetation type mapped. This mapping involved a reconnaissance-level field visit to match preliminary aerial photo signatures with vegetation types on the ground before photo interpretation, as well as spot-checking of selected areas in the field after preliminary photo interpretation to verify the accuracy of mapping of certain vegetation types.

Wetland Delineation

In 2011, an H. T. Harvey & Associates wetlands ecologist surveyed the Sunnyvale Channels, including a portion of the Moffett Channel and Pond A4, for areas potentially meeting the regulatory definition of waters of the U.S. The vegetation, soils, and hydrology of the site were examined following the guidelines outlined in the *Routine Determination Method* in the Corps of Engineers 1987 *Wetlands Delineation Manual* (Environmental Laboratory 1987). In addition, the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (hereafter "Regional Supplement"; U.S. Army Corps of Engineers (USACE 2008) was followed to document site conditions relative to hydrophytic vegetation, hydric soils, and wetland hydrology.

In 2013, a supplemental wetland delineation was conducted for three small areas that were not included in the original 2011 wetland delineation, but were later added to the Project Area. The supplemental wetland delineation included: 1) the exterior of the northwestern levee of the Moffett Channel; 2) a freshwater channel immediately north of the Sunnyvale Water Pollution Control Plant (WPCP); and 3) a small area adjacent to

Guadalupe Slough. The Project wetland delineation report was updated to include this information (Appendix O).

Fisheries Surveys

In 2001, the District conducted sampling within Pond A4 to determine the fisheries resources present (SCVWD 2001). In 2008, the District performed fish relocations at a maintenance activity work site within the East Channel (SCVWD 2008). Fish species, disposition, and abundance data were collected in samples, and summaries of the fish captured and released (natives) or sacrificed (non-natives) were prepared.

In January 2013, an H. T. Harvey & Associates fisheries ecologist conducted a focused field assessment of the Project Area to assess habitat quality and its potential to support special-status fish species, especially the longfin smelt (*Spirinchus thaleichthys*), green sturgeon (*Acipenser medirostris*), and Central California Coast (CCC) steelhead (*Oncorhynchus mykiss*).

Amphibian Surveys

In August and May 2012, the H. T. Harvey & Associates conducted surveys of 33 District sites, including the lower Sunnyvale Channels, to determine the presence and relative abundance of western pond turtles and non-native turtles at these sites (H. T. Harvey & Associates 2012a).

Bird Surveys

Between 1998 and 2000, the District conducted avian surveys at four salt evaporator ponds, including Pond A4 next to the Project Area and Ponds A5 South, A8 North, and A8 South in the Project vicinity, as part of the Lower Guadalupe River Flood Control Project (SCVWD 2000). The surveys were conducted to determine the distribution, abundance, and species richness at each of the ponds throughout the annual cycle. The District has also conducted surveys for the California clapper rail (*Rallus longirostris obsoletus*), western snowy plover (*Charadrius alexandrinus nivosus*), and burrowing owl (*Athene cunicularia*) in various parts of Santa Clara County since the mid-1990s. California clapper rail surveys have been conducted prior to maintenance activities in suitable habitat since 1996.

In 2007 and 2008, EDAW conducted a habitat assessment, burrow mapping study, and standardized protocol surveys for the burrowing owl along sections of multiple District-managed waterways, including the Sunnyvale Channels (EDAW 2008). The study was designed to comply with the District's Biodiversity Monitoring Plan and to monitor burrowing owl distribution, abundance, and trends within the SMP Program Area.

In 2007, EDAW conducted a biotic assessment of the Project Area on behalf of the District. The assessment included an initial evaluation of on-site habitat types and the potential for occurrence of special-status bird species based on habitat availability,

quality, and occurrences in the region (EDAW 2007a). Subsequently, H. T. Harvey & Associates conducted a focused assessment to determine if and where suitable habitat for the California brown pelican (*Pelecanus occidentalis californicus*), western snowy plover, white-tailed kite (*Elanus leucurus*), California black rail (*Laterallus jamaicensis coturniculus*), California clapper rail, and California least tern (*Sterna antillarum browni*) was present in the Project Area (H. T. Harvey & Associates 2011a).

Mammal Surveys

In November 2010, H. T. Harvey & Associates wildlife ecologists conducted a focused field assessment of habitat in the Project Area for its potential suitability for the salt marsh harvest mouse (*Reithrodontomys raviventris*) (H. T. Harvey & Associates 2011c). The focus of the assessment was the brackish tidal marshes on the exterior of Pond A4 and the pickleweed (*Sarcocornia pacifica*) dominated vegetation along the waterline of the interior of Pond A4 and in Moffett Channel and Guadalupe Slough, where harvest mice are most likely to occur in the Project Area.

In January 2013, an H. T. Harvey & Associates wildlife ecologist conducted focused surveys for nests of San Francisco dusky-footed woodrats (*Neotoma fuscipes annectens*), potential roosting sites of pallid bats (*Antrozous pallidus*) and other bats, and habitat for burrowing owls within and immediately adjacent to the Project Area.

Special-status Plant Surveys

In August 2012, an H. T. Harvey & Associates plant ecologist conducted a protocol-level survey for Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*). This species, which was recorded approximately 2,000 feet to the east of the East Channel just north of SR 237 in 2002 (CNDDDB 2013), was determined from preliminary studies to be the only special-status plant species with potential to occur in the Project Area. The August 2012 survey was conducted during the species' blooming period of May to October (Calflora 2013). Congdon's tarplant was not detected within the Project Area during the protocol-level survey.

Other Surveys and Monitoring Performed in the Project Vicinity

In addition to the surveys performed by the District as described above, a number of other survey efforts have been conducted within, or in the vicinity of, the Project Area. Between 1989 and 1990, H. T. Harvey & Associates conducted California clapper rail breeding and wintering surveys across South San Francisco Bay to satisfy requirements of a National Pollutant Discharge Elimination System (NPDES) permit issued to the City of San Jose (H. T. Harvey & Associates 1989, 1990a, 1990b). In addition, salt marsh harvest mouse surveys were conducted in three South San Francisco Bay marshes (Calaveras Point, Triangle Marsh, and Warm Springs Marsh) (H. T. Harvey & Associates 1990c).

Between 1990 and 1991, H. T. Harvey & Associates conducted clapper rail surveys in Guadalupe Slough and salt marsh harvest mouse surveys at two marsh sites adjacent to Guadalupe Slough to satisfy requirements of a NPDES permit issued to the City of Sunnyvale. In 1992, H. T. Harvey & Associates conducted call count censuses of clapper rails on Naval Air Station Moffett Field (Station) and a section of Guadalupe Slough in an effort to establish a baseline for the U.S. Navy in developing management practices and determining operational impacts on the Station (USFWS 1992). At the request of the City of Sunnyvale, H. T. Harvey & Associates conducted a survey along the levees on the east and north sides of Oxidation Pond #2 near the WPCP in 2004. The purpose of this survey was to assess the site as potential habitat for the California clapper rail prior to proposed work on the pond's interior levees. In 2011 and 2012, California clapper rail surveys were conducted at a 132 sites in the San Francisco Bay Estuary to inform the Invasive Spartina Project (ISP) about rail populations at sites slated for invasive spartina (*Spartina* spp.) treatment (Olofson Environmental Inc., 2011; ISP unpublished data).

There have also been other observations of California clapper rails in Guadalupe Slough recorded in Santa Clara County Bird Data (unpublished) or reported on eBird (2013) and/or the South Bay Birds list-serve (2013) that indicate clapper rails use the slough at least sporadically. Precise locations within Guadalupe Slough are not available for these records, but they include two individuals on 24 May 1993, one individual on 3 October 1993, three calling individuals on 1 September 1997 ("near the WPCP pond"), and one individual on 11 February 1998 ("near the WPCP pond"). In addition, one or two rails were detected in Guadalupe Slough just downstream of Pond A4 and the Moffett Channel during surveys conducted in 2012 as part of the ISP (California Coastal Conservancy unpublished data). Clapper rails have been reported to eBird (2013) from the WPCP vicinity on several occasions in recent years, though the precise locations and veracity of those reports is unknown.

3.3.2 Regulatory Setting

Biological resources are regulated by a number of federal, state, and local laws and ordinances, as described below.

Federal Regulations

Clean Water Act

Areas meeting the regulatory definition of "waters of the U.S." (jurisdictional waters) are subject to the jurisdiction of the USACE under provisions of Section 404 of the 1972 Clean Water Act (Federal Water Pollution Control Act) and Section 10 of the 1899 Rivers and Harbors Act (described below). These waters may include all waters used, or potentially used, for interstate commerce, including all waters subject to the ebb and flow of the tide, all interstate waters, all other waters (intrastate lakes, rivers, streams,

mudflats, sandflats, playa lakes, natural ponds, etc.), all impoundments of waters otherwise defined as “waters of the U.S.,” tributaries of waters otherwise defined as “waters of the U. S.,” the territorial seas, and wetlands (termed Special Aquatic Sites) adjacent to “waters of the U.S.” (33 CFR, Part 328, Section 328.3). Wetlands on non-agricultural lands are identified using the Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987).

Areas typically not considered to be jurisdictional waters include non-tidal drainage and irrigation ditches excavated on dry land, artificially irrigated areas, artificial lakes or ponds used for irrigation or stock watering, small artificial water bodies such as swimming pools, and water-filled depressions (33 CFR, Part 328).

Construction activities within jurisdictional waters are regulated by the USACE. The placement of fill into such waters must comply with permit requirements of the USACE. No USACE permit will be effective in the absence of state water quality certification pursuant to Section 401 of the Clean Water Act. The State Water Resources Control Board (SWRCB) is the state agency together with the Regional Water Quality Control Boards (RWQCBs) charged with implementing water quality certification in California.

Any work within areas defined as waters of the U.S. (i.e., wetlands and other waters), including waterways such as Moffett Channel, Guadalupe Slough, and the Sunnyvale Channels, will require a Section 404 fill discharge permit from the USACE and Section 401 Water Quality Certification from the RWQCB. Tidal brackish marsh, freshwater wetlands, and open water habitats as described below under *Existing Land Uses, Natural Communities, and Habitats* are generally considered waters of the U.S. and are subject to the jurisdiction of the USACE and RWQCB as such.

Porter-Cologne Water Quality Control Act

The RWQCB is responsible for protecting surface, ground, and coastal waters within its boundaries, pursuant to the Porter-Cologne Water Quality Control Act of the California Water Code. The RWQCB has jurisdiction under Section 401 of the Clean Water Act for activities that could result in a discharge of dredged or fill material to a water body. Federal authority is exercised whenever a proposed project requires a Clean Water Act Section 404 permit from the USACE in the form of a Section 401 Water Quality Certification. State authority is exercised when a proposed project is not subject to federal authority, in the form of a Notice of Coverage, Waiver of Waste Discharge Requirements. Many wetlands fall into RWQCB jurisdiction, including some wetlands and waters that are not subject to USACE jurisdiction. RWQCB jurisdiction of other waters, such as streams and lakes, extends to all areas below the ordinary high water mark.

The SWRCB has recently developed a preliminary draft Water Quality Control Policy that addresses numerous policy elements including development of a wetland definition

and description of methodology to be used in defining wetlands as part of waters of the State (SWRCB 2013).

Under the Porter-Cologne Water Quality Control Act, the SWRCB and the nine regional boards also have the responsibility of granting Clean Water Act NPDES permits and waste discharge requirements for certain point-source and non-point discharges to waters. These regulations limit impacts on aquatic and riparian habitats from a variety of urban sources.

As stated above, any activities within the Project Area that impact waters of the U.S./State will require 401 Certification and/or a Waste Discharge Requirement from the RWQCB. Some specific features in the Project Area in tidal brackish marsh, freshwater wetlands, and open water habitats are considered both waters of the U.S. and waters of the State. It is possible that some features, such as ditches, that are not considered waters of the U.S. are subject to the jurisdiction of the RWQCB as waters of the state.

Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act (1899) 33 U.S.C. 403 regulates the construction of structures, placement of fill, and introduction of other potential obstructions to navigation in navigable waters. Under Section 10 of the Act, the building of any wharfs, piers, jetties, and other structures is prohibited without Congressional approval, and excavation or fill within navigable or tidal waters requires the approval of the Chief of Engineers.

The USACE has the authority to issue permits for the discharge of refuse into, or affecting, navigable waters under section 13 of the 1899 Act (33 U.S.C. 407; 30 Stat. 1152). The Act was modified by title IV of P.L. 92-500, October 18, 1972; the Federal Water Pollution Control Act Amendments of 1972 (33 U.S.C. 1341-1345; 86 Stat. 877), as amended, established the NPDES permits.

Within the Project Area, Moffett Channel and Guadalupe Slough, as well as the lowermost reaches of the Sunnyvale Channels, are tidally influenced. Any activities conducted within or over the tidally influenced portions of these waterways, including aquatic habitats and mudflats below the mean high water elevation, would potentially require a Section 10 Letter of Permission.

Federal Endangered Species Act

The federal Endangered Species Act (FESA) protects listed wildlife species from harm or "take" which is broadly defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. Take can also include habitat modification or degradation that directly results in death or injury of a listed wildlife species. An activity can be defined as "take" even if it is unintentional or accidental. Listed plant species are provided less protection than listed wildlife species.

Listed plant species are legally protected from take under the FESA only if they occur on federal lands or if the project requires a federal action, such as a Clean Water Act Section 404 fill permit from the USACE.

The USFWS has jurisdiction over federally listed threatened and endangered wildlife species under the FESA, while the NMFS has jurisdiction over federally listed, threatened and endangered, marine and anadromous fish.

Based on a review of recent ecological studies of other projects in the vicinity (see Section 3.3.1); aerial photos and topographic maps; and other relevant scientific literature, technical databases, and resource agency reports, federally listed animal species that occur, or could potentially occur, in the Project Area include the green sturgeon, CCC steelhead, California least tern, California clapper rail (see Table 3.3-2 and Appendix N for details). In addition, the salt marsh harvest mouse may be present in suitable habitat immediately adjacent to the Project Area. No federally listed plant species are known or expected to occur in the Project Area.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act governs all fishery management activities that occur in federal waters within the United States' 200-nautical-mile limit. The Act establishes eight Regional Fishery Management Councils responsible for the preparation of fishery management plans (FMPs) to achieve the optimum yield from U.S. fisheries in their regions. These councils, with assistance from the NMFS, establish Essential Fish Habitat (EFH) in FMPs for all managed species. Federal agencies that fund, permit, or implement activities that may adversely affect EFH are required to consult with the NMFS regarding potential adverse effects of their actions on EFH, and respond in writing to recommendations by the NMFS.

The San Francisco Bay is officially listed as EFH related to the Pacific Coast Salmon FMP, and in the South Bay, the Chinook salmon (*Oncorhynchus tshawytscha*) represents this FMP (Pacific Fisheries Management Council 1999). However, Chinook are not known to spawn in any creeks flowing into the Project Area, and although occasional strays may occur in these creeks, they are expected to occur in the Project Area irregularly at best.

A number of fish species regulated by the Coastal Pelagics and Pacific Groundfish FMPs, such as the leopard shark (*Triakis semifasciata*), English sole (*Parophrys vetulus*), starry flounder (*Platichthys stellatus*), and big skate (*Raja binoculata*), occur in the tidal habitats of South San Francisco Bay and are expected to occasionally disperse upstream into the reaches of tidal sloughs in the Project Area, such as Moffett Channel and possibly the lower reaches of the Sunnyvale Channels. Species such as the northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), and jack mackerel (*Trachurus symmetricus*) also occur in the South Bay. These species are less likely to occur in the uppermost tidal reaches of sloughs where Proposed Project

activities would occur, but small numbers could potentially occur there. Thus, the NMFS would likely consider these tidal waters to be EFH related to all three of the aforementioned FMPs.

Federal Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (MBTA; 16 U.S.C., §703, Supp. I, 1989) prohibits killing, possessing, or trading of migratory birds except in accordance with regulations prescribed by the Secretary of the Interior. The trustee agency that addresses issues related to the MBTA is the USFWS. Migratory birds protected under this law include all native birds and certain game birds (e.g., turkeys and pheasants; USFWS 2005a). This act encompasses whole birds, parts of birds, and bird nests and eggs. The MBTA protects active nests from destruction and all nests of species protected by the MBTA, whether active or not, cannot be possessed. An active nest under the MBTA, as described by the Department of the Interior in its 16 April 2003 Migratory Bird Permit Memorandum, is one having eggs or young. Nest starts, prior to egg laying, are not protected from destruction. Almost all native bird species occurring in the Project Area are protected by the MBTA.

State Regulations

California Endangered Species Act

The CESA (Fish and Game Code of California, Chapter 1.5, Sections 2050-2116) prohibits the take of any plant or animal listed or proposed for listing as rare (plants only), threatened, or endangered. In accordance with the CESA, the California Department of Fish and Wildlife (CDFW) has jurisdiction over state-listed species. The CDFW regulates activities that may result in “take” of individuals listed under the Act (i.e., “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill”). Habitat degradation or modification is not expressly included in the definition of “take” under the Fish and Game Code.

The CDFW, however, has interpreted “take” to include the “killing of a member of a species which is the proximate result of habitat modification.” Based on a review of recent ecological studies of other projects in the vicinity (see Section 3.3.1); aerial photos and topographic maps; and other relevant scientific literature, technical databases, and resource agency reports, state-listed wildlife species occurring (or potentially occurring) in the Project Area include the longfin smelt, bank swallow (*Riparia riparia*), California clapper rail, California black rail, California least tern, and salt marsh harvest mouse (see Table 3.3-2 and Appendix N for details). No state-listed plant species are known or expected to occur in the Project Area.

California Environmental Quality Act

The California Environmental Quality Act (CEQA) and the CEQA Guidelines provide guidance in evaluating impacts of projects to biological resources and determining which

impacts will be significant. CEQA defines “significant effect on the environment” as “a substantial adverse change in the physical conditions which exist in the area affected by the proposed project.” Under CEQA Guidelines Section 15065, a project’s effects on biotic resources are deemed significant where the project would:

- “substantially reduce the habitat of a fish or wildlife species”
- “cause a fish or wildlife population to drop below self-sustaining levels”
- “threaten to eliminate a plant or animal community”
- “reduce the number or restrict the range of a rare or endangered plant or animal”

In addition to the Section 15065 criteria that trigger mandatory findings of significance, Appendix G of the CEQA Guidelines provides a checklist of other potential impacts to consider when analyzing the significance of project effects. The impacts listed in Appendix G may or may not be significant, depending on the level of the impact. For biological resources, these impacts include whether the project would:

- “have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife and or U.S. Fish and Wildlife Service”
- “have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service”
- “have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act”
- “interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites”
- “conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance”
- “conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan”

Section 15380(b) of the CEQA Guidelines provides that a species not listed on the federal or state lists of protected species may be considered rare if the species can be shown to meet certain specified criteria. These criteria have been modeled after the definitions in the FESA and the CESA and the section of the California Fish and Game Code dealing with rare or endangered plants or animals. This section was included in the guidelines primarily to deal with situations in which a public agency is reviewing a

project that may have a significant effect on a species that has not yet been listed by either the USFWS or CDFW or species that are locally or regionally rare.

The CDFW has produced three lists (amphibians and reptiles, birds, and mammals) of “species of special concern” that serve as “watch lists”. Species on these lists are of limited distribution or the extent of their habitats has been reduced substantially, such that threat to their populations may be imminent. Thus, their populations should be monitored. They may receive special attention during environmental review as potential rare species, but do not have specific statutory protection. All potentially rare or sensitive species, or habitats capable of supporting rare species, are considered for environmental review per the CEQA section 15380(b).

The CNPS, a non-governmental conservation organization, has developed lists of plant species of concern in California. Vascular plants included on these lists are defined as follows:

- List 1A Plants considered extinct.
- List 1B Plants rare, threatened, or endangered in California and elsewhere.
- List 2 Plants rare, threatened, or endangered in California but more common elsewhere.
- List 3 Plants about which more information is needed - review list.
- List 4 Plants of limited distribution-watch list.

These CNPS listings are further described by the following threat code extensions:

- .1 — seriously endangered in California;
- .2 — fairly endangered in California;
- .3 — not very endangered in California.

Although the CNPS is not a regulatory agency and plants on these lists have no formal regulatory protection, plants appearing on List 1B or List 2 are, in general, considered to meet the CEQA’s Section 15380 criteria, and adverse effects to these species may be considered significant. Impacts on plants that are listed by the CNPS on List 3 or 4 are also considered during CEQA review, although because these species are typically not as rare as those on List 1B or List 2, impacts on them are less frequently considered significant.

All impacts on biological resources will be considered during CEQA review of the Proposed Project in the context of this EIR.

California Fish and Game Code

The California Fish and Game Code includes regulations governing the use of, or impacts on, many of the state’s fish, wildlife, and sensitive habitats. The CDFW exerts jurisdiction over the bed and banks of rivers, lakes, and streams according to provisions

of sections 1601–1603 of the Fish and Game Code. The Fish and Game Code requires a Streambed Alteration Agreement for the fill or removal of material within the bed and banks of a watercourse or water body and for the removal of riparian vegetation.

Certain sections of the Fish and Game Code describe regulations pertaining to certain wildlife species. For example, Fish and Game Code sections 3503, 2513, and 3800 (and other sections and subsections) protect native birds, including their nests and eggs, from all forms of take. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered “take” by the CDFW. Raptors (i.e., eagles, falcons, hawks, and owls) and their nests are specifically protected in California under Fish and Game Code section 3503.5. Section 3503.5 states that it is “unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto.” Non-game mammals are protected by Fish and Game Code section 4150, and other sections of the Code protect other taxa.

Any work within channels with a clear bed and banks, including creeks, drainage channels, and sloughs within the Project Area, will require a Streambed Alteration Agreement from the CDFW per section of the California Fish and Game Code. All native bird species that occur in the Project Area are protected by the state Fish and Game Code. Projects may be required to take measures to avoid impacts on nesting birds per California Fish and Game Code sections 3503, 3513, and 3800. Native mammals and other species in the Project Area are also protected by the Code.

Local Regulations

City of Sunnyvale Tree Preservation Ordinance

The City of Sunnyvale’s Tree Preservation Ordinance (Sunnyvale Municipal Code, Chapter 19.94) provides for protection, installation, removal, and long-term management of significantly sized trees on private property and on City-owned golf courses and parks. The ordinance defines “protected tree” as a tree of “significant size” (i.e., a tree which has at least one trunk with a circumference 38 inches or greater measured 4.5 feet above ground level, or in which the measurements of the circumferences of each of the multi-trunks, when measured 4.5 feet above the ground level, added together equal an overall circumference of 113 inches or greater). The ordinance sets standards and criteria for issuance of tree removal permits, criteria for replacement trees, and requirements for replanting programs, tree relocation, and tree protection during site development or modification. The Proposed Project is expected to impact several trees of municipal ordinance size. The municipal ordinance covers trees on City properties and removal of other trees in the City. This issue is discussed further in Chapter 3.9, “Land Use and Planning”.

3.3.3 Environmental Setting

Climate and Soils

The Project Area is located in the *Mountain View* and *Milpitas, California* U.S. Geological Survey (USGS) 7.5-minute quadrangles. The Sunnyvale Channels are relatively flat with elevations ranging from approximately 0 to 150 feet National Geodetic Vertical Datum of 1929. The Project Area has a Mediterranean climate characterized by mild, wet winters, and warm, dry summers. Average annual precipitation in the Project vicinity is approximately 12.05 inches, and the average annual temperature, measured between 1998 and 2008, is 60.2 degrees Fahrenheit (°F) (Western Regional Climate Center 2012).

Twelve soil types are found in the Project Area (see **Figure 3** in **Appendix O** and **Figures 3.3-1a** through **3.3-1i** in **Appendix P**); the names of each of these soil types are listed in **Table 3.3-1**. Urban-land soil types are a complex of fill soils placed in areas that were once a part of, or directly adjacent to, the outer margins of the San Francisco Bay, as well as silts built up in adjacent tidal flats that support salt marshes (Natural Resources Conservation Service 2010). Soil textures vary widely at the site, and site soils are typically poorly drained with a high water table. Urban-land consists of areas where more than 85 percent of the surface is covered by asphalt, concrete, buildings, and other structures.

Table 3.3-1. Soil Types in the Project Area

Soil Number	Soil Name
101	Urban-land, 0 to 2 percent slopes, basins
102	Urban-land 0 to 2 percent slopes, alluvial fans
112	Xerorthents, trash substratum, 15 to 30 percent slopes
131	Urban-land Elpaloalto complex, 0 to 2 percent slopes
140	Urban-land, Flaskan complex, 0 to 2 percent slopes
145	Urban-land Hangerone, reclaimed complex, 0 to 2 percent slopes
150	Urban-land Embarcadero complex, 0 to 2 percent slopes
155	Novato clay 0 to 1 percent slopes, tidally flooded
156	Novato silty clay loam, excessive salinity, 0 to 1 percent slopes, protected
165	Urban-land Campbell complex 0 to 2 percent slopes
175	Urban-land, Botella complex 0 to 2 percent slopes
185	Urban-land Bayshore complex, 0 to 2 percent slopes

Source: SCS 1968.

Existing Land Uses, Natural Communities, and Habitats

The following discussion describes the land uses, natural communities, and habitat types that may be affected by the Proposed Project. Based on dominant plant species in the Project Area, the Project may affect the following natural communities/habitats: tidal brackish marsh, freshwater marsh, ruderal/non-native grasslands, open water, creeks and stream channels, and developed/landscaped habitats (**Figures 3.3-2a** through **3.3-3i** in **Appendix P**). The dominant and characteristic plant and animal species for each of these habitats are described below.

Tidal Brackish Marsh

Tidal brackish marsh habitat occurs in the upper intertidal reaches of sloughs draining into the Bay where vegetation is subject to tidal inundation diluted by freshwater flows from upstream. This habitat type is dominated by emergent, vascular plant species adapted to intermediate (brackish) soil water salinities. Short bulrushes such as alkali bulrush (*Bolboschoenus robustus*) and saltmarsh bulrush (*Bolboschoenus maritimus*) are key indicator species for this habitat type, and tend to dominate along channel edges. Tall bulrushes such as California bulrush (*Schoenoplectus californicus*) and hard-stemmed bulrush (*Schoenoplectus acutus*) are also common components of this habitat type and may co-dominate with short bulrushes near the transition zone between brackish and freshwater marsh. Other common plant species that occur in this habitat include cattails (*Typha* spp.), spearscale (*Atriplex prostrata*), and invasive perennial pepperweed (*Lepidium latifolium*).

Under existing conditions, the northern reaches of both the Sunnyvale Channels are tidally influenced by hydrologic connection with Guadalupe Slough. The East Channel connects directly with Guadalupe Slough, while the West Channel connects indirectly via the Moffett Channel. The approximate extent of tidal influence is the SR 237 crossing of the East Channel and the Mathilda Avenue crossing of the West Channel. However, the majority of marsh in these tidal zones is freshwater marsh, and only the lowermost reach of the East Channel and the lower portion of Moffett Channel support tidal brackish marsh (see **Figures 3.3-2a** through **3.3-3i** in **Appendix P**).

Tidal brackish marshes receive large, regular inputs of fresh water, and wildlife communities that occur in these marshes are largely similar to those that occur in freshwater marshes, with the potential for a few additional species more typically associated with salt marshes. Tidal brackish marshes in the Project Area are limited in extent and highly disturbed. They are located adjacent to maintenance roads where moderate levels of human disturbance (e.g., from vehicles and pedestrians) occur regularly. In addition, maintenance activities conducted by the District have reduced the amount of vegetative cover present in this habitat type. Further, the relatively small size of the tidal brackish marshes within the Project Area limits the abundance and diversity of wildlife species expected to occur in these habitat patches.

The Alameda song sparrow (*Melospiza melodia pusillula*), San Francisco common yellowthroat (*Geothlypis trichas sinuosa*), and marsh wren (*Cistothorus palustris*), are common breeders in tidal brackish marshes, and multiple pairs nest and forage within this habitat in the Project Area. Freshwater marsh species, such as the red-winged blackbird (*Agelaius phoeniceus*), can also breed in tidal brackish marshes and will occur as foragers in this habitat year-round, while Virginia rails (*Rallus limicola*) and sora (*Porzana carolina*) can be heard calling from this habitat during winter and migration.

The California vole (*Microtus californicus*) is a common small mammal species found in marshes in the Project Vicinity, and will breed in adjacent terrestrial habitats and forage in tidal brackish marshes. Insects with aquatic larvae, such as brine flies (family Ephydriidae) and chironomid midges (family Chironomidae), breed in freshwater or brackish habitats and can occur in large swarms in the spring and summer in the Project Area, providing food for aerial foragers such as swallows. Flocks of Canada geese (*Branta canadensis*), as well as many species of ducks and other waterfowl, forage here year-round, but occur in highest densities during winter and migration. Other common foragers in this habitat are the great blue heron (*Ardea herodias*), great egret (*Ardea alba*), and snowy egret (*Egretta thula*). Terrestrial wintering and migrating songbirds, including golden-crowned sparrows (*Zonotrichia atricapilla*), white-crowned sparrows (*Zonotrichia leucophrys*), and Lincoln's sparrows (*Melospiza lincolni*), forage in the Project Area in reeds and other tall vegetation in the tidal brackish marsh, as well as in adjacent grassland and ruderal habitats.

Freshwater Marsh

Freshwater marsh is present in the portions of the Sunnyvale Channels where perennial or near-perennial inundation by shallow freshwater occurs in an open environment. Freshwater marsh occurs both above and within the zone of tidal influence, and is most abundant north of Caribbean Drive. As mentioned above, most of the vegetation within the zone of tidal influence is dominated by freshwater marsh; only the lowermost reach of the East Channel and the lower portion of Moffett Channel support tidal brackish marsh. In most tidally influenced areas, the daily flushing of freshwater heavily dilutes the effects of periodic tidal inundation on soil water salinity, explaining the abundance of fresh rather than brackish conditions. Freshwater marshes are typically densely vegetated and are dominated by tules (*Schoenoplectus* spp.), rushes (*Juncus* spp.), sedges (*Cyperus* spp.), and cattails. Patchy aquatic vegetation also periodically appears in the flooded bed of the channels and along the water's edge and includes watercress (*Nasturtium officinale*), smartweeds (*Persicaria* spp.), floating water primrose (*Ludwigia peploides*), and American brooklime (*Veronica americana*).

Freshwater marshes in Santa Clara County can provide habitat for numerous wildlife species. However, similar to tidal brackish marsh, the freshwater marsh habitat in the Project Area is extremely limited in extent (consisting mostly of scattered small patches), is highly disturbed, and provides very little habitat for marsh-specialist species. Song sparrows (*Melospiza melodia*) will nest in some of the larger, denser patches of

freshwater marsh vegetation that may occur in the channel, although other marsh specialist species such as common yellowthroats (*Geothlypis trichas*) and Virginia rails are expected to occur infrequently, if at all, in such limited areas of vegetation. Common, urban-tolerant aquatic species, such as mallards (*Anas platyrhynchos*) and American coots (*Fulica americana*), that occur in the Sunnyvale Channels will take cover and forage in freshwater marsh vegetation. Common amphibians such as the native Sierran chorus frog (*Pseudacris sierrae*) and western toad (*Anaxyrus boreas*), as well as the non-native bullfrog (*Lithobates catesbeianus*) also occur in the small areas of freshwater marsh vegetation in the Project Area. Terrestrial species that occur in adjacent habitats, such as house finches (*Carpodacus mexicanus*), bushtits (*Psaltirparus minimus*), yellow-rumped warblers (*Setophaga coronata*), black phoebes (*Sayornis nigricans*), and sparrows, will forage in marsh vegetation occasionally.

Ruderal/Non-Native Grasslands

Ruderal/non-native grassland habitat occurs throughout the Project Area on the channel banks, levees, higher shoreline areas, and in staging areas. Drier areas near the tops of levees and in the staging areas are dominated by weedy, non-native species including brome grasses (*Bromus* spp.), wild oats (*Avena* spp.), Italian ryegrass (*Festuca perennis*), smilo grass (*Stipa miliacea*), wild radish (*Raphanus sativus*), black mustard (*Brassica nigra*), and sweet fennel (*Foeniculum vulgare*). On the lower portions of channel banks and in seasonally wet areas, community composition shifts towards more mesic species including English plantain (*Plantago lanceolata*), bristly ox-tongue (*Helminthotheca echioides*), poison hemlock (*Conium maculatum*), curly dock (*Rumex crispus*), green dock (*Rumex conglomeratus*), and knotgrass (*Paspalum distichum*). Patches of noxious invasive plant species, including English ivy (*Hedera helix*), German Ivy (*Delairea odorata*), and giant reed (*Arundo donax*), have also been documented to occur along the portions of the Sunnyvale Channels upstream of the zone of tidal influence and in portions of the staging areas. Invasive perennial pepperweed has been documented further downstream (EDAW 2007a).

Wildlife use of grasslands in much of the Project Area is limited by human disturbance, the small extent of grassland areas, and the isolation of habitat remnants from more extensive grasslands. As a result, some of the wildlife species associated with extensive grasslands in the South Bay, such as the grasshopper sparrow (*Ammodramus savannarum*), are absent from the patches of grassland within the urban matrix that occupies most of the Project Area. Many of the species that occur in the small grassland areas along the Sunnyvale Channels are species that occur in adjacent urban areas and use these grasslands for foraging. Such species include the Brewer's blackbird (*Euphagus cyanocephalus*), American crow (*Corvus brachyrhynchos*), black phoebe, mourning dove (*Zenaida macroura*), house finch, bushtit, and California towhee (*Melozone crissalis*). However, species that occur in more extensive grassland areas, such as the western meadowlark (*Sturnella neglecta*) and loggerhead shrike (*Lanius ludovicianus*), can be found in the northernmost portion of the Project Area, where the

Sunnyvale Channels are adjacent to expansive areas of open habitat on the old landfills surrounding the City of Sunnyvale Recycling Center and WPCP.

California ground squirrels (*Spermophilus beecheyi*) occur in grassland habitats both within and adjacent to the Project Area. Ground squirrels are an important component of grassland communities, providing a prey base for diurnal raptors and terrestrial predators, as well as nesting and roosting habitat for burrowing owls. Other rodent species that occur in the ruderal/non-native grassland habitat in the Project Area include the California vole, valley pocket gopher (*Thomomys bottae*), and deer mouse (*Peromyscus maniculatus*). Diurnal raptors such as red-tailed hawks (*Buteo jamaicensis*), northern harriers (*Circus cyaneus*), and white-tailed kites forage for these small mammals over grasslands during the day, and at night nocturnal raptors, such as barn owls (*Tyto alba*), will forage for nocturnal rodents, such as deer mice. While red-tailed hawks, red-shouldered hawks (*Buteo lineatus*), and barn owls are adapted to urban areas and will occur throughout the Project Area, most other diurnal raptors are expected to occur only in the northernmost portion of the Project Area, north of Caribbean Drive, where more extensive areas of open habitat occur.

Mammals such as the black-tailed jackrabbit (*Lepus californicus*) and striped skunk (*Mephitis mephitis*) utilize grasslands and ruderal habitats in the Project Area for foraging. Urban-adapted species, such as the striped skunk, will occur throughout the Project Area, while species that require dense grassland cover or more expansive areas for foraging, such as the black-tailed jackrabbit, are only expected to occur in the northern portion of the Project Area. Reptiles such as western fence lizards (*Sceloporus occidentalis*), western skinks (*Plestiodon skiltonianus*), western terrestrial garter snakes (*Thamnophis elegans*), racers (*Coluber constrictor*), common kingsnakes (*Lampropeltis getula*), and southern alligator lizards (*Elgaria multicarinata*) frequent grassland habitats, and may occur throughout the Project Area.

Open Water

Aquatic or open water habitats are permanently or semi-permanently flooded, and support less than 5 percent vegetation cover in emergent or submerged states. Open water surfaces in the Project Area are represented by both the tidal and nontidal portions of the Sunnyvale Channels.

The Sunnyvale Channels provide relatively low-quality habitat for most wildlife species compared to those in more naturally formed channels, due to the channelized nature of these channels, the lack of high-quality habitat complexity such as riffle and pool complexes, relatively shallow water (and thus relatively high temperatures in summer), and regular disturbance of habitats and associated species due to frequent maintenance. Both channels flow northward through a mix of urban, business park, and light industrial settings before reaching the brackish marsh habitat associated with Guadalupe Slough; thus, habitat quality in the deeper, more well-vegetated lower, tidal

reaches of these channels is somewhat higher than in the upstream portions of the channels.

The East Channel is an open-water channel that extends approximately 6.5 miles from Junipero Serra Channel downstream to Guadalupe Slough; it has an average bed width of 7 to 30 feet, and mean higher high water depth in tidal reaches is approximately 7.45 feet. The East Channel bed is primarily earthen north of Highway 101, but alternates between earthen bottom and hardscaped or lined bottom (generally with concrete or sacked concrete) south of Highway 101. There are 18 roadway crossings, all of which are concrete culverts, and multiple drop structures and/or hydraulically steep ramps.

The West Channel is a mostly open-water channel that extends approximately 3 miles from Maude Avenue downstream to Moffett Channel, which then flows into Guadalupe Slough. Bed widths range from 5 to 30 feet, and mean higher high water depth in tidal reaches is approximately 7.45 feet. There are several roadway crossings consisting of box culverts. In one location, the channel is carried underground through a box culvert for approximately 0.5 mile, from just south of Highway 101 downstream to Ross Drive. Such areas are described below in terms of the hydrologic regimes and the salinity of the water.

Although the Sunnyvale Channels provide relatively low-quality habitat, a number of wildlife species use the open water within these channels. In 2008, the District relocated fish within the East Channel as part of the SMP. Only two species were identified: the California roach (*Lavinia symmetricus*) and Sacramento sucker (*Catostomus occidentalis*). Few additional native aquatic species are likely to occur in these channels due to the relatively poor quality of the stream habitat, but non-native crayfish (*Procambarus clarkii*) are present. Common, urban-adapted wildlife species such as native raccoons (*Procyon lotor*) and non-native roof rats (*Rattus rattus*) will make use of these channels as a source of water and for foraging. Common species of waterfowl that use shallow streams and are tolerant of high levels of human disturbance, including mallards, American coots, and pied-billed grebes (*Podilymbus podiceps*), occur along these channels. A belted kingfisher (*Megaceryle alcyon*) was observed foraging along the channel during the January 2013 surveys. Insectivores such as dragonflies, bats, and fly-catching birds will forage aerially over these channels, while herons and egrets will forage in the channels. Common amphibians such as the native Sierran chorus frog and western toad, as well as the non-native bullfrog, will breed and forage in these channels.

In addition, Pond A4 and the WPCP water treatment ponds occur immediately adjacent to the Project Area. Pond A4 is an open-water salt pond that is currently not tidally influenced. The pond is managed by operation of a pump located at its southeast corner. Pond A4 is characterized by a large area of open water, floating algae, and a series of islands that run parallel to the southern edge of the pond. Pond A4 supports fairly high waterbird abundance and diversity. It hosts large numbers of gulls, terns, and

waterfowl, especially during the winter months and during spring and fall migration, and it provides foraging habitat for locally breeding species, such as the double-crested cormorant (*Phalacrocorax auritus*), American avocet (*Recurvirostra americana*), California gull (*Larus californicus*), and Forster's tern (*Sterna forsteri*) (SCVWD 2000).

The WPCP Ponds support an even greater diversity of waterbirds, based on data collected by birders (Santa Clara County Bird Data, unpublished; South Bay Birds List-serve 2013). Ducks and gulls comprise the majority of the waterbirds using this pond during most of the year, although large numbers of Wilson's phalaropes (*Phalaropus tricolor*) and red-necked phalaropes (*Phalaropus lobatus*) forage in these ponds as well. At times, drawdowns in these ponds expose some mud at the edges, which during migration can support high densities of sandpipers and other shorebirds. As at Pond A4, the majority of these birds are nonbreeders that forage and roost in the pond, and roost along the surrounding levees, during migration and in winter. Human disturbance by joggers, cyclists, and walkers along the levees surrounding these ponds inhibits nesting by birds on the levees, but some waterbirds (particularly ducks) nest in vegetation around these ponds and forage with their broods within the pond.

A stormwater ditch runs parallel to the East Channel between Caribbean Drive and SR 237. The ditch provides relatively low-quality habitat for most wildlife species. The common wildlife species and waterfowl that use of the open water habitat in the East Channel also likely make use of this ditch when water is present.

Developed/Landscaped

Within the Project Area, developed features mainly consist of graveled District channel maintenance roads located on the tops of the levees on both sides of the Sunnyvale Channels and bare ground associated with the Sunnyvale Channels and the WPCP. There are also buildings, bridges, and other structures in the Project Area. Several roadways cross over the Sunnyvale Channels and structures are immediately adjacent to the channel easements on both Sunnyvale Channels upstream of Caribbean Drive. Several of the Project staging areas are also partially paved and/or landscaped.

The majority of trees that occupy the upper channel sections and staging areas are landscape varieties such as eucalyptus (*Eucalyptus* spp.), Peruvian pepper tree (*Schinus molle*), black locust (*Robinia pseudoacacia*), and holly oak (*Quercus ilex*). However, single stems or small groups of native trees, such as coast live oak (*Quercus agrifolia*) and black walnut (*Juglans hindsii*), are also present along both Sunnyvale Channels.

Many common, urban-adapted wildlife species occur in the developed/landscaped portions of the Project Area. Culverts and bridges provide nesting habitat for avian species such as swallows, black phoebes, house finches, and house sparrows (*Passer domesticus*). Powerline towers that parallel the East Channel provide perches for red-tailed hawks and common ravens (*Corvus corax*), though no large stick nests were

observed on these structures during the reconnaissance survey. Trees along the East and West Channels provide suitable nesting habitat for common, urban-adapted raptors such as Cooper's hawks (*Accipiter cooperii*) and red-shouldered hawks. In addition, large eucalyptus trees located north of Caribbean Drive within and adjacent to the Project Area provide suitable nesting habitat for raptor species that require large, open areas for foraging, such as red-tailed hawks and white-tailed kites. Landscaped vegetation growing within or adjacent to the Project Area provides cover and nesting habitat for common, urban adapted species of birds, such as dark-eyed juncos (*Junco hyemalis*), Anna's hummingbirds (*Calypte anna*), and American robins (*Turdus migratorius*).

Small cavities and exfoliating bark on trees, and crevices in bridges and culverts, provide roosting habitat for bats within the Project Area. Individual bats, such as big brown bats (*Eptesicus fuscus*) and hoary bats (*Lasiurus cinereus*), may roost in small cavities in trees in the Project Area, and western red bats (*Lasiurus blossevillii*) may roost in the foliage of trees. However, trees with cavities of sufficient size to support large colonies of roosting bats are not present. The majority of roadway crossings in the Project Area consist of short (i.e., extending the width of the road), chambered concrete box culverts, which provide limited day and night-roosting habitat for common species of bats such as Yuma bats (*Myotis yumanensis*) and Mexican free-tailed bats (*Tadarida brasiliensis*). These box culverts have flat ceilings and lack features such as drains, pipes, and recesses within which large numbers of bats can roost. Nevertheless, small numbers of bats (i.e., one or two per culvert) could potentially roost in these culverts in small features such as weepholes or crevices. In total, the 21 short concrete box culverts within the Project Area could provide day and night-roosting habitat for as many as 20 to 40 individual bats. The dual-span bridge over the East Channel at Caribbean Drive is unlikely to support roosting bats due to the tidal influence of the water level, which causes the water to be high enough at least once a day to prevent bats, especially juvenile bats, from leaving their roost to forage.

Box culverts at North Mathilda Avenue, Ross Drive, Ahwanee Avenue, East Duane Avenue, and East El Camino Real extend between 0.1 mile and more than 0.5 mile underground. These long culverts could potentially contain recesses (e.g., access holes with manhole covers) that provide day and night-roosting habitat, as well as breeding habitat, for several larger colonies of bats (e.g., up to 30 individuals). In addition, long horizontal crevices were observed between the deck of the bridge over the East Channel at the SR 237 crossing and its support beams. Bat guano and urine staining around and under these crevices indicated that they are used by roosting bats. Because the deck of this bridge is located sufficiently above the ordinary high water line to allow bats access throughout the day and night, these crevices provide suitable breeding, day-roosting, and night-roosting habitat for a potentially large colony of bats (i.e., 100 to 1000 individuals) such as the Mexican free-tailed bat and Yuma bat. Many species of bats that roost in the Project Vicinity may forage aerially over the Sunnyvale Channels.

Special-Status Plant and Animal Species

CEQA requires assessment of the effects of a project on species that are “threatened, rare, or endangered”; such species are typically described as “special-status species”. For planning purposes and for assessment of impacts of the Proposed Project, special-status species have been defined as described below. Impacts on these species are regulated by some of the federal and state laws and ordinances described under “Regulatory Setting” above.

Special-Status Plants

For purposes of this report, “special-status” plants are considered plant species that are:

- Listed under the FESA as threatened, endangered, proposed threatened, proposed endangered, or a candidate species.
- Listed under the CESA as threatened, endangered, rare, or a candidate species.
- Listed by the CNPS as rare or endangered on List 1A, 1B, or 2.
- Listed by the CNPS on List 3 or 4.

A list of 77 plants listed as special-status and potentially occurring in the Project Area was compiled using CNPS lists and CNDDDB records (2013), and reviewed for their potential to occur within the Project Area. Analysis of the documented habitat requirements and occurrence records associated with all of the species considered allowed us to reject 76 of these species as not occurring within the Project Area. A list of all species considered but rejected, and the reason for rejection is available in **Appendix L**.

Of the species reviewed, only Congdon’s tarplant was considered to have the potential to occur within the Project Area based on its general habitat requirements and known distribution. Congdon’s tarplant is included on the CNPS List 1B.2; it is considered “fairly threatened in California.” An expanded description of this species is included in **Appendix M**. It is typically found in valley and foothill grassland (alkaline)/California annual grassland habitat on alkaline soils. In 2002, Congdon’s tarplant was recorded approximately 2,000 feet to the east of the East Channel just north of SR 237 (CNDDDB 2013). However, a protocol-level survey conducted during the blooming period (August 2012) confirmed the absence of this species in the Project Area.

Special-Status Animals

For purposes of this report, “special-status” animals are animal species that are:

- Listed under the FESA as threatened, endangered, proposed threatened, proposed endangered, or a candidate species.

- Listed under the CESA as threatened, endangered or a candidate species.
- Designated by the CDFW as a California species of special concern.
- Listed in the California Fish and Game Code as a fully protected species (birds at §3511, mammals at §4700, reptiles and amphibians at §5050, and fish at §5515).
- Protected by the Marine Mammal Protection Act.

The legal status and potential for occurrence of special-status wildlife species known to occur or potentially occurring in the general vicinity of the Project Area are given in **Table 3.3-2**. Expanded descriptions are included in **Appendix N** for those species that are known to occur in the Project Area; for which potentially suitable habitat occurs within or in the general vicinity of the Project Area; for which the site is accessible to animals from known populations; and for which resource agencies and/or the Habitat Plan have expressed particular concern such that more expanded discussion is required. Species that are listed in Table 3.3-2 but not discussed in detail in Appendix N have no suitable habitat or reasonable expectation of occurrence in the Project Area.

The willow flycatcher (*Empidonax traillii*) formerly nested commonly in riparian habitats on the Santa Clara Valley floor, but local populations were extirpated by the late 1960s. This species still occurs as an uncommon migrant in the Project Area, between wintering areas in Mexico and breeding areas to the north (Unitt 1987; Hunter et al. 2005). However, migrant willow flycatchers occurring in the Project Area are likely from breeding populations outside the state, and, thus, would not be individuals from the state-listed California population or the federally listed subspecies *extimus* that resides in riparian habitat of southern California (Unitt 1987).

In addition, the following special-status species that are present in less urbanized settings in the South Bay are absent from the Project Area due to a lack of suitable habitat and/or isolation of the Project Area from populations by urbanization: California tiger salamander (*Ambystoma californiense*), California horned lizard (*Phrynosoma coronatum frontale*), California red-legged frog (*Rana draytonii*), foothill yellow-legged frog (*Rana boylei*), bald eagle (*Haliaeetus leucocephalus*), Swainson's hawk (*Buteo swainsoni*), long-eared owl (*Asio otus*), short-eared owl (*Asio flammeus*), yellow-breasted chat (*Icteria virens*), grasshopper sparrow, Townsend's big-eared bat (*Corynorhinus townsendii*), ringtail (*Bassariscus astutus*), and American badger (*Taxidea taxus*).

Seven other bird species that are considered California species of special concern occur in the Project Area as nonbreeding transients, foragers, or migrants, but have never been recorded nesting in, or very close to, the Project Area. These are the redhead (*Aythya americana*), Barrow's goldeneye (*Bucephala islandica*), common loon (*Gavia immer*), American white pelican (*Pelecanus erythrorhynchos*), western least bittern (*Ixobrychus exilis hesperis*), purple martin (*Progne subis*), black swift (*Cypseloides*

niger), Vaux's swift (*Chaetura vauxi*), olive-sided flycatcher (*Contopus cooperi*), and black tern (*Chlidonias niger*). However, because these species are only considered species of special concern when nesting, they are not "special-status species" when they occur as nonbreeding visitors to the Project Area, and are not discussed further in this document.

Bird species that are listed as threatened or endangered under the CESA and/or the FESA are considered "special-status species" year-round even if they do not nest in the Project Area. California black rails, California least terns, and bank swallows occasionally occur in the Project Area as nonbreeding migrants, transients, or foragers, but are not known or expected to nest, to occur regularly, or to occur in large numbers. Although these species occur in the Project Area only infrequently and/or in small numbers, because they are considered "special-status" year-round they are discussed in further detail below. The willow flycatcher would be treated similarly to these species if the individuals that occur as migrants in the Project Area were from California breeding populations. However, due to the rarity of the species as a breeder in the state and the small number of breeding pairs to the north of the Project Area, the probability that any California-breeding willow flycatchers migrate through the Project Area is extremely low.

A number of other special-status wildlife species are addressed in greater detail below because they are known to breed or could potentially breed in the Project Area or its vicinity; because they occur fairly commonly as non-breeders in the Project Area (and thus could potentially be substantially affected by activities that occur under the Proposed Project); and/or because they are of particular concern to regulatory agencies. These include the green sturgeon, Central Valley fall-run Chinook salmon, Central California Coast steelhead, longfin smelt, western pond turtle (*Actinemys marmorata*), black skimmer (*Rynchops niger*), California brown pelican, California clapper rail, western snowy plover northern harrier, white-tailed kite, American peregrine falcon (*Falco peregrinus anatum*), golden eagle (*Aquila chrysaetos*), burrowing owl, loggerhead shrike, yellow warbler (*Setophaga petechia*), San Francisco common yellowthroat, Alameda song sparrow, Bryant's savannah sparrow (*Passerculus sandwichensis alaudinus*), tricolored blackbird (*Agelaius tricolor*), salt marsh wandering shrew (*Sorex vagrans halicoetes*), salt marsh harvest mouse, San Francisco dusky-footed woodrat, pallid bat, western red bat, and Pacific harbor seal (*Phoca vitulina richardsi*).

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Table 3.3-2. Special-Status Animal Species, ESA/CESA Status, Habitat Description, and Potential for Occurrence within the Sunnyvale Channels Project Area

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
Federal or State Endangered, Threatened, or Candidate Species			
Green sturgeon (<i>Acipenser medirostris</i>)	FT, CSSC	Spawns in large river systems such as the Sacramento River; forages in nearshore oceanic waters, bays, and estuaries.	Absent as Breeder. Known to occur in the San Francisco Bay, though it apparently occurs only as a rare, nonbreeding visitor to the South Bay. Unlikely to occur in the Sunnyvale Channels due to their narrow, freshwater nature and lack of suitable spawning conditions. Foraging juvenile and adult green sturgeon could enter the lower portions of the Sunnyvale Channels from the open waters of the Bay, albeit infrequently and in low numbers, if at all. Should stray individuals occur within the Sunnyvale Channels, their presence would be limited to reaches of tidal influence (i.e., downstream of the SR 237 crossing of the East Channel, and downstream of Java Drive within the West Channel). All tidally influenced areas of the San Francisco Bay, up to the elevation of mean higher high water, including all portions of the Sunnyvale Channels located upstream to the upper limits of tidal action, have been designated as critical habitat for this species.
Longfin smelt (<i>Spirinchus thaleichthys</i>)	ST, CSSC	Spawns in fresh water in the upper end of the San Francisco Bay; occurs year-round in the South Bay.	May be Present. Has been reported in the South Bay year-round (Wernette 2000), and has been collected in Alviso Slough (EDAW Inc. 2007b). However, fish sampling in Coyote Slough and the Island Ponds has detected the species only in January and March, suggesting that it may be absent during the summer (Hobbs et al. 2012). May be present in the tidal reaches of sloughs in the South Bay, including Moffett Channel and Guadalupe Slough. Unlikely to occur in the Sunnyvale Channels, particularly upstream of tidal reaches, due to a lack of suitable conditions (e.g., overly warm temperatures). However, stray individuals could occur within the reaches of tidal influence within the Sunnyvale Channels (i.e., downstream of the SR 237 crossing of the East Channel, and downstream of Mathilda Avenue within the West Channel). Although freshwater input from the flood control channels could provide suitable spawning habitat for longfin smelt in the tidal reaches of the Sunnyvale Channels, potential spawning substrate in the channels is limited and the degraded conditions of the channels are only marginally suitable for spawning.

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
Central California Coast steelhead (<i>Oncorhynchus mykiss</i>)	FT	Cool streams with suitable spawning habitat and conditions allowing migration between spawning and marine habitats.	Absent as Breeder. This species has not been documented in the Sunnyvale Channels, Moffett Channel, or Guadalupe Slough, and no suitable spawning habitat is present within the Project Area or upstream in San Tomas Aquino Creek. However, small numbers of stray, individual steelhead associated with spawning streams elsewhere in the South Bay could occasionally wander onto tidal portions of the Project Area to forage. Because no suitable spawning habitat for steelhead occurs within the Project Area or upstream, this species is not expected to spawn or occur regularly in the Sunnyvale Channels. Critical habitat for this species within the Project Area includes the Moffett Channel, Guadalupe Slough, and the tidally influenced portions of the Sunnyvale Channels (USFWS 2005b).
California tiger salamander (<i>Ambystoma californiense</i>)	FT, ST	Vernal or temporary pools in annual grasslands or open woodlands.	Absent. Populations located on the Valley floor have been extirpated due to habitat loss, and the species is now considered absent from the majority of the valley floor, including the Project Area (H. T. Harvey & Associates 1999a, 2012b; SCVWD 2011). No recent records of California tiger salamanders are located within 1.3 miles of the Project Area (CNDDDB 2013) and the species is determined to be absent from the Project Area and the surrounding vicinity.
California red-legged frog (<i>Rana draytonii</i>)	FT, CSSC	Streams, freshwater pools, and ponds with emergent or overhanging vegetation.	Absent. This species has been extirpated from the majority of the Project region, including the entire urbanized Valley floor, due to development, the alteration of hydrology of its aquatic habitats, and the introduction of non-native predators such as non-native fishes and bullfrogs (H. T. Harvey & Associates 1997; SCVWD 2011). Thus, California red-legged frogs are determined to be absent from the Project Area.
Bank swallow (<i>Riparia riparia</i>)	ST	Colonial nester on vertical banks or cliffs with fine-textured soils near water.	Absent as Breeder. No recent nesting records from Santa Clara County, and no suitable nesting habitat occurs in or near the Project Area. Occurs only as a rare migrant.
Bald eagle (<i>Haliaeetus leucocephalus</i>)	SE, SP	Occurs mainly along seacoasts, rivers, and lakes; nests in tall trees or in cliffs, occasionally on electrical towers. Feeds mostly on fish.	Absent. Has been recorded nesting in the Project region only at inland reservoirs; very rare along the Bay edge. No suitable nesting or foraging habitat at the Project Area.

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
Swainson's hawk (<i>Buteo swainsoni</i>)	ST	Nests in trees surrounded by extensive marshland or agricultural foraging habitat.	Absent. Apparently historically nested in small numbers in Santa Clara County, and there is an 1894 nest record from the Berryessa area (eastern San Jose) (Bousman 2007b). Currently, the species is known to occur in the Project region only as a very infrequent transient during migration, and neither suitable nesting nor foraging habitat is present in the Project Area. Thus, the species is determined to be absent.
California clapper rail (<i>Rallus longirostris obsoletus</i>)	FE, SE, SP	Salt marsh habitat dominated by pickleweed and cordgrass.	Absent as Breeder. Suitable foraging habitat for California clapper rails occurs in the portion of Moffett Channel that lies within the Project Area (H. T. Harvey & Associates 2011a). Clapper rails have been recorded in marsh habitat in the Project Area during the nonbreeding season in Moffett Channel and along Guadalupe Slough (eBird 2013; Santa Clara County bird data, unpublished; South Bay Birds list-serve 2013). Because California clapper rails typically nest in broader marshes with well-developed tidal channels (conditions that are absent from the Project Site), they are not expected to nest within or adjacent to the Project Site. The West Channel upstream of Moffett Channel and all of the East Channel lack suitable marsh habitat for use by this species.
California black rail (<i>Laterallus jamaicensis coturniculus</i>)	ST, SP	Breeds in fresh, brackish, and tidal salt marsh.	Absent as Breeder. Occurs in the South Bay primarily as a scarce winter visitor. However, the species has recently been recorded during the breeding season in Triangle Marsh along Coyote Slough approximately 2.9 miles northeast of the Project Site (Hall pers. comm.), and along lower and mid-Alviso Slough (http://groups.yahoo.com/group/south-bay-birds), indicating that this species may nest in some areas in the South Bay. Suitable habitat for nonbreeding California black rails in the Project Area occurs in tidal marshes in Moffett Channel (H. T. Harvey & Associates 2011a). However, this species has not been recorded in the Project Area despite intensive coverage of the area by birders, and few individuals, if any, are expected to forage at the Project Area at any given time.

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
Western snowy plover <i>(Charadrius alexandrinus nivosus)</i>	FT, CSSC	Sandy beaches on marine and estuarine shores and salt pans in San Francisco Bay saline managed ponds.	Absent. Although western snowy plovers are known to nest in nearby managed ponds northeast of the Project Area, they are not expected to occur in Pond A4, in the WPCP ponds, or elsewhere within or adjacent to the Project Area owing to a lack of suitable habitat. The islands in Pond A4 (remnants of former wave breaks paralleling the southern levee) are too highly vegetated and too narrow to provide suitable nesting habitat for snowy plovers, and human recreational activity on the levees of Pond A4 and the WPCP ponds preclude nesting on levees by this sensitive species.
California least tern <i>(Sterna antillarum browni)</i>	FE, SE, SP	Nests along the coast on bare or sparsely vegetated, flat substrates. In the South Bay, nests in salt pannes and on an old airport runway. Forages for fish in open waters.	Absent as Breeder. Does not nest in the Project Area. The South Bay is an important post-breeding staging area for least terns to gather before migration, and the species has been recorded foraging in Pond A4 on rare occasions (Santa Clara County Bird Data, unpublished). Because they have been observed foraging in Pond A4 and their preferred post-breeding staging area (currently) is nearby (just north of Moffett Field), least terns may forage in the WPCP ponds and associated channel immediately adjacent to the Project Area on occasion. Least terns forage primarily in managed ponds and over the open Bay, and thus foraging least terns are not expected to use the Sunnyvale Channels or Moffett Channel (i.e., the entirety of the Project Area). The Project Area also lacks high-quality roosting habitat, as human recreational disturbance precludes the use of levees adjacent to Pond A4 and the WPCP ponds as regular least tern roost sites, and no such least tern roosts have been observed in these areas (Santa Clara County Bird Data, unpublished).

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
Salt marsh harvest mouse <i>(Reithrodontomys raviventris)</i>	FE, SE, SP	Salt marsh habitat dominated by common pickleweed.	Absent. Salt marsh harvest mice have been documented in the vicinity of Pond A4 (H. T. Harvey & Associates 1991; USFWS and California Department of Fish and Game [CDFG] 2007), and suitable habitat for this species occurs immediately adjacent to the Project Area along the southern edge of Pond A4, within Guadalupe Slough, and in a mitigation area located east of the Twin Creeks Sports Complex. However, suitable pickleweed-dominated salt marsh habitat for this species is absent from the Project Area (H. T. Harvey & Associates 2011a). In addition, salt marsh harvest mice have not been documented to move more than 16.4 feet over bare ground (Bias 1994, Geissel et al. 1988). Thus, they are unlikely to move from occupied areas adjacent to the Project Area across maintenance roads or levees within the Project Area. Further, in the absence of pickleweed, they are not expected to move from salt marshes downstream from the Project Area onto the site itself. In summary, suitable breeding and foraging habitat is absent within the Project Area and salt marsh harvest mice are not expected to occur within the Project boundaries. However, the species may be present in tidal and non-tidal brackish marsh immediately adjacent to the Project Area.
California Species of Special Concern			
Central Valley fall-run Chinook salmon <i>(Oncorhynchus tshawytscha)</i>	CSSC	Cool rivers and large streams that reach the ocean and that have shallow, partly shaded pools, riffles, and runs.	Absent as Breeder. Chinook are not known to spawn in any creeks flowing into the Project Area, and suitable spawning habitat is absent. Occasional stray Chinook from Central Valley streams may occur in the Project Area as foragers, as they do in other South Bay streams. However, these stray individuals are expected to occur irregularly and in extremely low numbers, and do not represent a native run.
Foothill yellow-legged frog <i>(Rana boylei)</i>	CSSC	Partially shaded shallow streams and riffles with a rocky substrate. Occurs in a variety of habitats in coast ranges.	Absent. Although this species occurs in less urbanized areas of Santa Clara County, it has disappeared from farmed and urbanized areas as well as many of the perennial streams below major reservoirs (H. T. Harvey & Associates 1999b). Suitable habitat for foothill yellow-legged frogs is absent from the Project Area.

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
Western pond turtle (<i>Actinemys marmorata</i>)	CSSC	Permanent or nearly permanent water in a variety of habitats.	May be Present. Although breeding populations have been extirpated from most agricultural and urbanized areas in the Project region, individuals of this long-lived species still occur in urban streams and ponds in the Santa Clara Valley. A small population is known to be present in Moffett Channel west of the Project Area. Although none were observed in the lower reaches of the Project Area during focused surveys in 2012 (H. T. Harvey & Associates 2012a), it is likely that small numbers of western pond turtles occur in the Project Area in canals associated with the WPCP, and possibly in the Sunnyvale Channels (H. T. Harvey & Associates 2012b).
California horned lizard (<i>Phrynosoma coronatum frontale</i>)	CSSC	Open habitats with sandy, loosely textured soils, such as chaparral, coastal scrub, annual grassland, and clearings in riparian woodlands with the presence of native harvester ants (<i>Pogonomyrmex barbatus</i>).	Absent. Suitable habitat is not present in the Project Area.
Black skimmer (<i>Rynchops niger</i>)	CSSC (nesting)	Nests on abandoned levees and islands in saline managed ponds and marshes.	Absent as Breeder. Black skimmers have nested in the South Bay since 1994, including areas near the Project on islands in saline managed ponds in the Alviso area (e.g., on ponds AB1, AB2, A1, A2W, A7, A8 and A16, and Pond A12 (Bousman 2007c). However, the islands in Pond A4 adjacent to the Project Area are too highly vegetated and too narrow to provide suitable nesting habitat. Further, despite the high level of both professional and recreational birdwatching conducted in the Project vicinity, the species has not been documented nesting in the Project Area. Black skimmers may forage in tidal portions of the sloughs in the Project Area, and possibly in Pond A4, but they are not expected to occur in the Sunnyvale Channels outside of tidal/bayland areas.

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
Northern harrier (<i>Circus cyaneus</i>)	CSSC (nesting)	Nests in marshes and moist fields, forages over open areas.	Absent as Breeder. Suitable nesting and foraging habitat for one pair of northern harriers is present at the mouth of Moffett Channel and along Guadalupe Channel outside of the Project Area, but does not occur within the Project Area itself. This species may forage year-round on the former landfills along the lower East and West Channels and along levees north of Caribbean Drive, but is not expected to forage in more densely developed/urbanized areas.
Long-eared owl (<i>Asio otus</i>)	CSSC (nesting)	Riparian bottomlands with tall, dense willows and cottonwood stands (also dense live oak and California Bay along upland streams); forages primarily in adjacent open areas.	Absent. Rare resident and occasional winter visitor in Santa Clara County (Bousman 2007d). Suitable nesting and foraging habitat for long-eared owls is not present in the Project Area.
Short-eared owl (<i>Asio flammeus</i>)	CSSC (nesting)	Nests in marshes and moist fields, forages over open areas.	Absent. Has been recorded nesting in the Project region only in the Palo Alto Flood Control Basin, though it has not been confirmed nesting there since the 1970s. Determined to be absent from the Project Area.

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
Burrowing owl <i>(Athene cunicularia)</i>	CSSC	Nests and roosts in open grasslands and ruderal habitats with suitable burrows, usually those made by California ground squirrels.	<p>Present. During surveys conducted in the winter of 2007 to 2008 (EDAW 2008), a burrowing owl was detected on the west bank of the East Channel opposite the Twin Creeks Sports Complex and a burrow with evidence of owl use (i.e., whitewash) was documented along the West Channel in the Project Area. During 2012 and early 2013, one to two burrowing owls were reported on the landfill just west of the West Channel, north of Caribbean Drive (South Bay Birds List-serve 2013). In addition, in November 2012 the District reported a burrowing owl on the west side of the West Channel just upstream of the Carl Road bridge (Hernandez pers. comm.). The CNDDDB (2013) includes two records of burrowing owls along the northernmost portion of the West Channel and one record adjacent to the northernmost portion of the East Channel. Ruderal habitats in the Project Area, particularly those on the former landfills surrounding the City of Sunnyvale Recycle Center and WPCP, provide suitable nesting, roosting, and foraging habitat for one or two pairs of burrowing owls. Potentially suitable nesting, roosting, and foraging habitat for burrowing owls is also present in Staging Area sites 13, 14, and 15, although no evidence of owls was observed in these staging areas during reconnaissance-level surveys. There is a low probability that individual burrowing owls would roost in burrows elsewhere in the Project Area (e.g., in areas where the channels are lined on both sides by development) due to the limited extent of ruderal habitat and proximity of tall trees and developed areas. Both of the Sunnyvale Channels are lined with development upstream of the Caribbean Drive channel crossings.</p>
Loggerhead shrike <i>(Lanius ludovicianus)</i>	CSSC (nesting)	Nests in tall shrubs and dense trees; forages in grasslands, marshes, and ruderal habitats.	<p>May be Present. Nests in a number of locations in the Project region where open grassland, ruderal, or agricultural habitat with scattered brush, chaparral, or trees provides perches and nesting sites (Bousman 2007e), though populations seem to have declined in recent years as suitable habitat has been increasingly developed. Ruderal habitats at the Project Area, particularly those on the former landfills surrounding the City of Sunnyvale Recycle Center and WPCP, provide suitable nesting and foraging habitat for one or two pairs, but the species is not expected to occur elsewhere in the Project Area due to the limited extent of open habitat.</p>

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
Yellow warbler (<i>Setophaga petechia</i>)	CSSC (nesting)	Nests in riparian woodlands.	Absent as Breeder. Prefers riparian corridors with adjacent open space (rather than in heavily developed areas) and an overstory of mature cottonwoods and sycamores, a midstory of box elders and willows, and a substantial shrub understory (Bousman 2007f). Riparian habitats with reduced understory, abundant non-native vegetation, and immediately adjacent development (such as the habitat in the Project Area) are generally not used by this species, although individuals may forage in these areas during migration. The dense vegetation along the levees adjacent to Pond A4 and channels associated with the WPCP as well as trees and shrubs along the Sunnyvale Channels provide suitable foraging habitat for this species, and many yellow warblers will forage in these areas during migration. Thus, suitable nesting habitat for yellow warblers is absent from the Project Area, but this species will occur throughout the Project Area as a migrant during the spring and fall.
San Francisco common yellowthroat (<i>Geothlypis trichas sinuosa</i>)	CSSC	Nests in herbaceous vegetation, usually in wetlands or moist floodplains.	Present. Common yellowthroats nesting in the Project Area are of the special-status subspecies <i>sinuosa</i> (San Francisco Bay Bird Observatory [SFBBO] 2012). The greatest proportion of nesting records in the Project region occur within brackish and freshwater marshes near the edge of the Bay, and in early-successional riparian habitat in broader floodplains (Bousman 2007g). Nests are typically located in extensive stands of bulrushes in brackish marshes and dense cattail beds in freshwater marshes, but the species also nests in forbs in riparian habitats. The species has been recorded in both the spring and summer at Pond A4 (SCVWD 2000), and is expected to nest in tidal brackish marsh habitat along Moffett Channel and the lower reaches of the Sunnyvale Channels north of Caribbean Drive.
Yellow-breasted chat (<i>Icteria virens</i>)	CSSC (nesting)	Nests in dense stands of willow and other riparian habitat.	Absent. This species is a rare breeder, and only slightly more regular transient, in willow-dominated riparian habitats in the Project region. However, suitably large, dense stands of riparian habitat are not present in the Project Area. Determined to be absent.

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
Alameda song sparrow <i>(Melospiza melodia pusillula)</i>	CSSC	Nests in salt marsh, primarily in marsh gumplant and cordgrass along channels.	Present. The <i>pusillula</i> subspecies of song sparrow is endemic to Central and South San Francisco Bay. In the Project Area, this subspecies occurs in the taller vegetation found along tidal sloughs. The location of the interface between populations of the Alameda song sparrow (<i>pusillula</i>) and the common race that breeds in freshwater riparian habitats in the region (<i>gouldii</i>) is not definitive due to difficulties distinguishing these subspecies in the field. Song sparrows nesting along the lower portions of the Sunnyvale Channels may belong to the <i>pusillula</i> or <i>gouldii</i> subspecies, or may be intergrades between the two (SFBBO 2012). However, this subspecies is known to nest in marsh habitat in the Project region, and is presumed to be present (and relatively common) in brackish marsh habitat in the upper reaches of the Project Area north of Caribbean Drive.
Grasshopper sparrow <i>(Ammodramus savannarum)</i>	CSSC (nesting)	Nests and forages in grasslands, meadows, fallow fields, and pastures.	Absent. Known to occur in the Project region primarily in grasslands and less frequently disturbed agricultural habitats, mostly in the foothills. Suitably extensive grasslands are not present in the Project Area.
Bryant's savannah sparrow <i>(Passerculus sandwichensis alaudinus)</i>	CSSC	Nests in pickleweed dominant salt marsh and adjacent ruderal habitat.	Present. In the South San Francisco Bay, nests primarily in short pickleweed-dominated portions of diked/muted tidal salt marsh habitat and in adjacent ruderal habitats (Rottenborn 2007). This species may nest in low numbers around the edge of Pond A4 immediately adjacent to the Project Area, and additional suitable nesting habitat occurs in the City of Sunnyvale mitigation area (for impacts on wetlands and salt marsh harvest mice) located immediately south of the Project Area near the confluence of the East Channel and Guadalupe Slough. No suitable nesting habitat occurs within the Project Area. During the nonbreeding season, <i>alaudinus</i> and other savannah sparrow subspecies may forage in open areas in the Project Area, such as on the former landfills surrounding the City of Sunnyvale Recycle Center and WPCP and along levees north of Caribbean Drive.

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
Tricolored blackbird (<i>Agelaius tricolor</i>)	CSSC (nesting colony)	Nests near fresh water in dense emergent vegetation.	Absent as Breeder. Typically nests in extensive stands of tall emergent herbaceous vegetation in non-tidal freshwater marshes and ponds, which are not present in the Project Area. Not known to nest in tidal habitats in the South Bay, and has not been recorded nesting in the Project Area. However, the species is known to forage in the Project Area during the nonbreeding season, particularly along the lower West Channel and on the former landfills, and is known to roost in marshes along Moffett Channel.
Salt marsh wandering shrew (<i>Sorex vagrans halicoetes</i>)	CSSC	Medium to high marsh 6 to 8 feet above sea level with abundant driftwood and common pickleweed.	Absent. Formerly more widely distributed in the San Francisco Bay Area, this small insectivorous mammal is now confined to salt marshes of the South Bay (Findley 1955). Salt marsh wandering shrews occur most often in medium to high wet tidal marsh (6 to 8 feet above sea level), with abundant driftwood and other debris for cover (Shellhammer 2000). Typically, they are found in fairly tall pickleweed, in which they build nests. No pickleweed habitat suitable for salt marsh wandering shrews occurs within the Project Area and the species is not expected to occur within the Project boundaries. However, this species may occur adjacent to the Project Area in the same areas where the salt marsh harvest mouse may occur, in pickleweed-dominated habitat along the southern edge of Pond A4, within Guadalupe Slough at its confluence with the East Channel, and in a mitigation area located east of the Twin Creeks Sports Complex adjacent to the Project Area.
Pallid bat (<i>Antrozous pallidus</i>)	CSSC	Forages over many habitats; roosts in caves, rock outcrops, buildings, and hollow trees.	Absent as Breeder. Historically, pallid bats were likely present in a number of locations throughout the Project region, but their populations have declined in recent decades. No known maternity colonies are present within the Project Area, and this species has been extirpated as a breeder from urban areas close to the Bay, as in the case of the Project Area. There is a low probability that the species occurs in the Project vicinity at all due to urbanization; however, individuals from more remote could potentially forage within the Project Area over open habitats on rare occasions.

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
Townsend's big-eared bat <i>(Corynorhinus townsendii)</i>	CSSC	Roosts in caves and mine tunnels, and occasionally in deep crevices in trees such as redwoods or in abandoned buildings, in a variety of habitats.	Absent. No known extant populations occur on the Santa Clara Valley floor, and no breeding sites are known from the Project Area. Suitable breeding habitat is not present in the Project Area.
Western red bat <i>(Lasiurus blossevillii)</i>	CSSC	Roosts in foliage in forest or woodlands, especially in or near riparian habitat.	Absent as Breeder. Occurs as a migrant and winter resident, but does not breed in the Project region. May roost in the foliage of trees virtually anywhere in the Project Area, but is expected to roost primarily in riparian areas.
San Francisco dusky-footed woodrat <i>(Neotoma fuscipes annectens)</i>	CSSC	Nests in a variety of habitats including riparian areas, oak woodlands, and scrub.	Absent. Currently, with the exception of records along Coyote Creek and along the edges of the Valley, San Francisco dusky-footed woodrats are not known to occur in the more urbanized portions of Santa Clara County (H. T. Harvey & Associates 2010). Marginally suitable habitat for dusky-footed woodrats occurs in areas of thick, shrubby vegetation and arundo along the East Channel. However, no woodrats or woodrat nests were observed in this area during the January 2013 focused survey. Thus, this species is determined to be absent from the Project Area.
American badger <i>(Taxidea taxus)</i>	CSSC	Burrows in grasslands and occasionally in infrequently disked agricultural areas.	Absent. Known to occur in the Project region primarily in extensive grasslands and less frequently disturbed agricultural habitats, mostly in the foothills. Suitably extensive grasslands are not present in the Project Area.
State Fully Protected Species			
California brown pelican <i>(Pelecanus occidentalis californicus)</i>	SP (nesting colony and communal roosts)	Undisturbed islands near estuarine, marine, subtidal, and marine pelagic waters.	Absent. Brown pelicans are uncommon nonbreeding visitors in Santa Clara County. The species is known to occur in the open-water habitat of Pond A4 (SCVWD 2000), which it uses for foraging and likely for bathing and loafing; however, it is expected to occur only in low numbers due to the relatively low density of fish present compared to other available habitat in the South Bay. The Sunnyvale Channels and the reach of Moffett Channel in the Project Area are too narrow to provide suitable foraging habitat for brown pelicans. Brown pelicans are thus not expected to occur in the Project Area.

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
American peregrine falcon <i>(Falco peregrinus anatum)</i>	SP	Forages in many habitats; nests on cliffs and tall bridges and buildings.	Absent as Breeder. Peregrine falcons are known to nest on electrical transmission towers near managed ponds more than 2 miles to the north and northwest of the Project Area, but are not known or expected to nest in the Project Area. However, peregrine falcons occur as occasional foragers around Pond A4 and the WPCP ponds, and likely forage along levees and in ruderal grasslands associated with former landfills and the WPCP.
Golden eagle <i>(Aquila chrysaetos)</i>	SP	Breeds on cliffs or in large trees (rarely on electrical towers), forages in open areas.	Absent as Breeder. Suitable nesting habitat is not present in the Project Area. An immature golden eagle was observed along the canals west of the WPCP in January 2012 (South Bay Birds List-serve 2013). This species is expected to forage in open habitats within and adjacent to the Project Area (such as on the old landfills) only infrequently based on the limited number of recorded occurrences in this area by birders.
White-tailed kite <i>(Elanus leucurus)</i>	SP	Nests in tall shrubs and trees, forages in grasslands, marshes, and ruderal habitats.	May be Present. In the vicinity of the Project Area, the species is known to nest along the northern edge of Santa Clara County throughout the open areas edging the San Francisco Bay (Bousman 2007h). There are a number of records from Moffett Field to the west and some from Sunnyvale Baylands Park to the east (Santa Clara County Bird Data, unpublished; South Bay Birds List-serve 2013). The juxtaposition of suitable trees for nesting and open ruderal habitat for foraging makes the old landfills adjacent to the northern part of the Project Area suitable for nesting by up to one or two pairs.
Ringtail <i>(Bassariscus astutus)</i>	SP	Cavities in rock outcrops and talus slopes, as well as hollows in trees, logs, and snags that occur in riparian habitats and dense woodlands, usually in close proximity to water.	Absent. This species occurs in less urbanized settings in the South Bay; however, there are no records from the Project Area. Suitable riparian and dense woodland habitats are absent from the Project Area, and the species is not expected to occur.

Name	ESA/ CESA Status	Habitat	Potential for Occurrence in the Project Area
Other Special-status Species			
Pacific harbor seal (<i>Phoca vitulina richardsi</i>)	MMPA	Throughout the northern Atlantic and Pacific Oceans along coastal waters, river mouths, and bays	May be Present. Permanent resident of San Francisco Bay. Primary haul-out sites in San Francisco Bay include Mowry Slough (243 seals in 1999), 5 miles northwest of the Project Area. Suitable haul-out sites for harbor seals are present in the Project region in the tidal reaches of sloughs in the South Bay area. No pupping sites or major haul-out sites are present within the Project Area or its vicinity, though the species is an occasional visitor to Moffett Channel and Guadalupe Slough.

Key to Status Abbreviations: Federally Endangered (FE); Federally Threatened (FT); State Endangered (SE); State Threatened (ST); State Protected (SP); California Species of Special Concern (CSSC); Species Protected by the Marine Mammal Protection Act (MMPA).
 Source: H.T. Harvey and Associates 2013.

3.3.4 Impact Analysis

Criteria for Determining Significance

For the purposes of this analysis, the Proposed Project would result in a significant impact on biological resources if it would:

- a) have a substantial adverse effect, either directly or through habitat modification, on an identified candidate, sensitive, listed, or special status species in any local, regional, state, or federal plan, policy, or regulation;
- b) have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal) through direct removal, filling, hydrological interruption, or other means;
- c) have a substantial adverse effect on any other sensitive natural community identified in local, regional, state, or federal plans, policies, or regulations (such as riparian habitat, oak woodlands, etc.);
- d) interfere substantially with the movement of any native resident or migratory species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites; or
- e) conflict with the provisions of an adopted Habitat Conservation Plan/Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Topics Dismissed in the Initial Study Checklist

The Initial Study Checklist (IS) dismissed potential impacts of the Proposed Project related to conflicts with approved conservation plans because the Proposed Project activities are not covered in any conservation plans. The IS dismissed potential impacts to wildlife corridors because the Project was (at the time the IS was prepared) not expected to interfere substantially from the existing baseline condition for movement of any native resident or migratory fish or wildlife species. However, impacts to wildlife corridors are evaluated in Impact BIO-16 of this EIR because the Project components evaluated in this EIR have been changed in a few ways from the components evaluated in the IS, and these changes may result in the impacts from the Project to wildlife corridors.

Methodology

The primary adverse effects on biological resources of the Proposed Project would occur during Project construction and the period immediately following construction. Potential impacts are expected to include adverse effects on wetland, instream, and upland habitats; impacts on associated plant communities and habitats of plant and wildlife species; and the potential degradation of water quality caused by releases of sediment or placement of fill or other construction materials.

Potential impacts on biological resources as a result of the Proposed Project were systematically evaluated at the Project level. These impacts were first evaluated to qualitatively describe how Proposed Project activities could impact biological resources, and whether impacts would be temporary (i.e., occurring during Project construction activities and the period immediately following these activities) or permanent. Impacts were then evaluated with the application of District BMPs identified in Chapter 2, "Project Description". For impacts that would remain potentially significant even with the implementation of BMPs, feasible mitigation measures are identified, and the significance of the impacts was re-evaluated to determine if mitigation measures would reduce impacts to a less-than-significant level.

Biological resources would be affected not only by specific Project activities but also, in a few cases, by mitigation measures and BMPs. The net effect of these mitigation measures and BMPs would be beneficial. However, in a few cases, adverse effects may occur during implementation of these measures. For example, although relocation of western pond turtles from work areas may be necessary to avoid mortality of those individuals, some stress on these individuals may occur during relocation. As a result, the effects of the BMPs and the mitigation measures also were analyzed, where appropriate.

Post-project maintenance would occur as needed and may require periodic routine activities such as sediment removal and vegetation management at the Sunnyvale Channels, which could impact biological resources. Potential impacts due to stream maintenance activities are addressed by the District's Stream Maintenance Program Subsequent EIR (refer to Chapter 2.0, "Project Description"). The Stream Maintenance Program Subsequent EIR is available for review online: <http://valleywater.org/SMPSEIR2011.aspx>. See Volume 2, Chapter 3, Section 3.3 for the Biological Resources impact discussion. While specific maintenance activities for the post-project Sunnyvale Channels are uncertain at this time, the Stream Maintenance Program Subsequent EIR addresses the complete range of potential maintenance activities that could be conducted at the Sunnyvale Channels.

General Discussion of Impacts of Proposed Activities on Biological Resources

The following sections describe generally how Project components may impact aquatic and wetland communities as well as wildlife and fisheries¹. These discussions are detailed here, rather than in the individual (e.g., species-specific) impact discussions that appear later in this document, to avoid redundancy. For example, the general discussions of how the Proposed Project activities may affect birds would apply to the more species-specific impacts sections for the California clapper rail, California black rail, burrowing owl, loggerhead shrike, San Francisco common yellowthroat, Alameda song sparrow, Bryant's savannah sparrow, white-tailed kite, and other common and special-status birds. Thus, to avoid repetition within each section, the species-specific impact sections reference the general discussions, included below, on the types of impacts that could occur. The species-specific impact sections then detail specific Project-related impacts on each species, as appropriate, as well as the potential significance under CEQA of the impacts.

Project activities that fall under the category of 'other modifications' (e.g., outfall/wingwall bank stabilization, cutting of low flow notches, installation of a chain link fence, and tree removal) occur at various locations throughout the Project Area. Because these activities would affect a limited area, impacts are likewise expected to be limited in extent. Nevertheless, these 'other modification' activities may have impacts similar to those that would result from construction of floodwalls, levee modifications, maintenance road improvements, bridge/culvert modifications, rock slope protection, and sediment removal. Therefore, the discussions of how these activities would affect biological resources pertain to similar 'other modification' activities.

Determination of Impacts on Aquatic and Wetland Communities

This section describes the general approach used to determine impacts of the Sunnyvale Channels Project on aquatic and wetland communities, including areas that are considered jurisdictional waters of the U.S./State. Project activities may affect aquatic and wetland communities through direct or indirect disturbance of vegetation and the disturbance, modification, or destruction of habitat. Impacts from activities such as sediment removal and bench construction (a subcomponent of rock slope protection along one reach) are considered temporary because sedimentation and vegetation regrowth will result in a resumption of conditions similar to existing conditions within a few years following construction. However, impacts that result in fill of wetlands or aquatic habitat, such as placement of rock slope protection, are considered permanent.

The general types of potential impacts that were considered in this evaluation, grouped by Project component, are described below. The Project-specific impact section then

¹ Because special-status plant species were determined to be absent from the Project Area, discussion of the impacts of the Proposed Project on plants is not warranted.

provides details on specific Project-related impacts that may occur as well as their potential significance under CEQA.

Floodwalls and Maintenance Road Modifications

The construction of Project floodwalls and modification of maintenance roads may result in impacts on communities within the Sunnyvale Channels, downstream aquatic habitats, and adjacent waters (e.g., the channels discharging into the West Channel near the WPCP and the ditch located adjacent to the East Channel between Caribbean Drive and SR 237). The excavation and replacement of soil along the inboard or outboard sides of levee/maintenance roads for floodwall installation, the loosening of compacted soils, the use of fill material for maintenance road improvements and erection of ramps, and the grading of temporary staging areas may result in an increase in short term erosion and sedimentation due to a loss of vegetation. The construction of inboard floodwalls may also increase shading along the channels. However, given the widths of these channels and the locations and heights (1 to 7.5 feet) of the proposed floodwalls, the floodwalls would result in little reduction in the amount of direct sunlight received by wetland vegetation and would not substantially affect conditions within the channels.

Bridge/Culvert Modifications, Levee Modifications, Rock Slope Protection, and Sediment Removal

Bridge/culvert modifications, levee modifications, rock slope protection, and sediment removal activities may result in the direct modification of wetlands and aquatic communities within the Project Work Area, as well as indirect impacts on downstream wetlands and aquatic communities (see **Figures 3.3-2a** through **3.3-3i** in **Appendix P**). The Project Work Area includes the channels themselves, the District's existing right-of-way/channel easements, and staging areas located outside of the channel easements.

The most notable impacts resulting from these activities are the removal of sediment and wetland vegetation and the placement of fill and materials, from channel regrading and installation of rock, in the channels. These activities result in the direct loss of wetland and aquatic habitats, as well as the degradation of habitat quality in wetland and aquatic habitats that remain. Materials may fall into the channels during the demolition and construction of bridges/culverts and their associated components and during re-grading of channel banks. Subsequent installation of erosion control materials, hydroseeding, and planting may also result in the deposit of materials into the channels. Activities that occur within the stream channels (e.g., bridge/culvert reconstruction, grading of slopes, installation of rock slope protection, and sediment removal) may require temporary water diversions or dewatering, which could result in changes to the extent of wetland and aquatic communities present in a work site.

Wetland vegetation may be lost as a result of mechanical or physical clearing in the work site (including access areas) and damage to vegetation may occur as a result of crushing by equipment; trampling by personnel; and compaction of soil, which could result in damage to plant roots. Removal of wetland vegetation may result in the loss of

result in damage to plant roots. Removal of wetland vegetation may result in the loss of propagules for colonization of downstream areas. Further, because barren slopes are more susceptible to erosion from incident rainfall, the loss of wetland vegetation and non-instream vegetation along stream banks following Project activities may result in an increase in erosion and sedimentation. This may lead to the filling in of the channels and damage to wetland vegetation. The Proposed Project's potential to cause soil erosion and loss of topsoil is evaluated in Impact GEO-3 in Chapter 3.5, "Geology and Soils", and impacts on water quality resulting from the potential release of existing contaminated soil and groundwater are evaluated in Impact HW-1 in Chapter 3.7, "Hazards and Hazardous Materials".

Determination of Impacts on Wildlife and Fisheries

The impact assessment for wildlife and fisheries was developed using general life history and habitat requirements for each of the five vertebrate classes (i.e., fish, amphibians, reptiles, birds, and mammals) and invertebrate groups (e.g., insects). The impact analysis looked at each of the Project components (i.e., floodwalls, levee modifications, maintenance road improvements, bridge/culvert modifications, earthen channel with rock, rock slope protection, and sediment removal), broken down by location and stream conditions, and evaluated how each of the five vertebrate classes could be affected by these Project components. Proposed Project activities may affect animals through direct or indirect disturbance of individuals and populations and disturbance, modification, or destruction of habitats. The effects depend on the community supported in the activity location as well as the type of activities undertaken. The general types of potential impacts that were considered in this evaluation, grouped by Project component, are described below. The Project-specific impact section then provides details on the specific Project-related impacts that may occur as well as their potential significance under CEQA, based on the criteria discussed in the following section.

The following discussion applies to all fish and wildlife species and communities, including common and special-status species.

Floodwalls and Maintenance Road Modifications

Fish. During construction, the excavation and replacement of soil for new floodwall footings and stabilization and the loss of vegetation on channel banks as a result of floodwall installation activities may result in minor sediment mobilization into aquatic habitat. Stream bank erosion is a natural process that can be beneficial to fish by providing a source of the boulders, cobble, and gravel necessary for high-quality habitat. However, when natural levels of erosion are exceeded, increases in turbidity and sediment input may cause stress to fish because of feeding difficulties or displacement. Additionally, minor spills of petrochemicals, hydraulic fluids, and solvents may occur during vehicle and equipment refueling or as a result of leaks, adversely affecting water quality and potentially killing or injuring fish.

The construction of floodwalls may require the installation of sheet piles; however, the Proposed Project's use of vibratory hammers would reduce effects of pile driving to levels that are not expected to cause injury or mortality of fish.

Amphibians and Reptiles. Potential effects on amphibians and reptiles as a result of floodwall construction activities could include injury or mortality of individuals by equipment, vehicle traffic, and worker foot traffic. In addition, petrochemicals, hydraulic fluids, and solvents that were spilled or leaked from vehicles or equipment may kill individuals at any life stage, and increased sediment deposition may suffocate embryos and tadpoles. Further, amphibians and reptiles that are found during pre-construction surveys and relocated to suitable habitat outside of the work site (in accordance with BMP BI-2) may be subjected to physiological stress and greater risk of predation.

Fossorial (burrowing) species and species that use existing animal burrows as refugia (e.g., Sierran chorus frogs, western toads, western fence lizards, California newts [*Taricha torosa*], western skinks, and gopher snakes [*Pituophis catenifer*]) may be crushed in their burrows by the passage of heavy equipment or trapped and suffocated. Furthermore, loss of subterranean habitat (i.e., burrows) as a result of Project construction may result in the displacement of small mammals and invertebrates that would serve as a food source for some species of amphibians and reptiles.

Daily movements throughout amphibians' and reptiles' home ranges may be temporarily affected during Project activities as a result of disturbance of non-instream habitat. Seasonal movements (i.e., breeding, aestivation) also may be affected, depending on the timing and duration of Project activities.

Substrate vibrations or sounds may cause individuals to move out of refugia, exposing them to a greater risk of predation or desiccation, and may interfere with their ability to detect predators, causing a decrease in time spent foraging. Additionally, increases in human concentration and activity in the vicinity of suitable habitat may result in an increase in native and non-native predators that would be attracted to trash left in the work site. For example, raccoons, American crows, and ravens would be attracted to trash and would prey opportunistically on amphibians.

Birds. Birds that forage or roost in the work site would be affected while heavy ground disturbance, noise, and vibration caused by the work activity proceeded. Although adult birds (with the possible exception of burrowing owls) are not expected to be killed or injured, as they could easily fly from the work site prior to such effects occurring, especially eggs or young in nests could be destroyed during Project activities by personnel or equipment. Project activities causing a substantial increase in noise, movement of equipment, or human presence near active nests could result in the abandonment of nests, and possibly the loss of eggs or young as a result. In addition, increased human activity may affect the behavior of birds, causing them to avoid work sites and possibly exposing them to increased competition with other birds in the areas to which they dispersed and increased levels of predation caused by unfamiliarity with

the new area. Increases in human concentration and activity associated with construction in the vicinity of suitable habitat also may result in an increase in native and non-native predators that would be attracted to trash left in the work site and a reduction in the quality of breeding or foraging habitat caused by the introduction of non-native vegetation.

Clearing of vegetation and removal of trees associated with construction may result in the temporary or permanent loss of breeding and/or foraging habitat. In addition, increased sedimentation or hazardous material spills from Project activities may result in the temporary or permanent degradation of water quality and, hence, habitat quality in marsh or aquatic habitats downstream from work sites and could impact aquatic and wetland bird species.

Mammals. During floodwall construction, smaller mammals may be crushed or injured by personnel or equipment. Furthermore, species that seek safety in burrows (mice, skunks, squirrels) could be killed or entombed in collapsed burrows. Larger, more mobile mammal species, such as gray foxes (*Urocyon cinereoargenteus*), and some smaller mammals would vacate the area, potentially exposing them to increased competition from conspecifics already occupying the area to which they were displaced and increased levels of predation because of unfamiliarity with the new area or lack of sufficient refugia. Disturbance of denning/nesting species by construction may be great enough to cause adults to abandon nests with young.

Invertebrates. Invertebrates occurring in work areas could be either killed directly (e.g., by crushing) or adversely affected by the loss of host plants or disturbance of refugia. For species such as moths and butterflies, host plants may be damaged or killed as a result of work site clearing (e.g., before the installation of bank armoring or during the creation of access roads or staging areas), crushing by equipment, trampling by personnel, and soil compaction by heavy equipment. In addition, these species may be adversely affected by habitat conversion, which could result from the unintentional introduction of non-native grasses and forbs to work sites.

Bridge/Culvert Modifications, Levee Modifications, Rock Slope Protection, and Sediment Removal

Fish. Bridge/culvert modifications, levee modifications, rock slope protection, and sediment removal activities may require temporary dewatering of the affected channel (in areas that are not already seasonally dry during Project activities) to minimize impacts on water quality. In accordance with BMP BI-2, the District may capture and relocate native fish before the initiation of activities that would require temporary water diversions or dewatering. During relocation operations, fish would be subject to harassment, pursuit, capture, mortality, and related stresses associated with netting and electrofishing. In addition to direct injury and mortality, the effects of electrofishing may include reduced growth rates of injured fish for at least a year following the electrofishing event (Dalby et al. 1996; Ainslie et al. 1998). Fish that were not relocated and that

remained within the work site may be subjected to degraded water quality, temporary blockage of migration, stranding in isolated pools, and mortality as a result of bridge/culvert modification activities. These activities may also necessitate the operation of heavy equipment within the streambed (after dewatering). Movement of heavy equipment may compact the substrate, potentially killing benthic invertebrates (which may serve as prey for fish), embedding gravel within finer sediments, and otherwise altering habitat for fish and their prey.

The loss of instream cover, such as vegetation and large woody debris, as a result of sediment removal or lowering of the channel may adversely affect fish, such as the Sacramento sucker and California roach, as a result of increased predation caused by a decrease in the availability of escape cover and the alteration of local hydraulics (e.g., increasing water velocity), which could reduce the frequency of riffle and pool habitat (Stillwater Sciences 2006), and the loss of refugia during high flows. Sediment and vegetation removal also would result in the loss of substrate used by various fish for foraging or spawning. The placement of fill and materials, such as rock, in the channels would result in the loss of some aquatic habitat for fish. However, as described above, the Sunnyvale Channels provide relatively low-quality habitat for fish species, due to their channelized nature, the lack of high-quality habitat complexity, relatively shallow water, and regular disturbance of habitats due to frequent maintenance. Thus, the loss of instream cover and habitat is expected to have a less substantial impact on fish than would similar activities on a more naturally formed stream. Further, levee modifications and placement of rock slope protection could have benefits on fish habitat. If left untreated, eroding and destabilized streambanks, which are pervasive in the Project Area (see Chapter 3.8, "Hydrology, Geomorphology & Water Quality"), will generally become progressively more severe with increased erosion and flooding risks. Thus, by reducing erosion and resulting sediment inputs into streams, levee modifications and placement of rock slope protection may result in a long-term beneficial impact on habitat quality for fish. Overall, approximately 15,077 linear feet (2.86 miles) of existing erosional sites would be repaired by the Proposed Project.

In addition, contact of uncured concrete with water could release chemicals that could impair the health of fish. Fish that remained within or downstream from work areas may be subjected to degraded water quality as a result of these activities. Other effects of bridge/culvert modifications, earthen channel, rock slope protection, and sediment removal activities on fish would be similar to those described above for floodwalls and maintenance road improvements.

Amphibians and Reptiles. The most notable impacts resulting from bridge/culvert modifications, levee modifications, rock slope protection, and sediment removal activities would occur as a result of removal of sediment and wetland vegetation and the placement of fill and materials, such as rock, in the channels (see **Figures 3.3-2a** through **3.3-3i** in **Appendix P**). These activities would result in the direct loss of wetland and aquatic habitats used by amphibians and reptiles, as well as the degradation of

habitat quality in wetland and aquatic habitats that remain, and individual amphibians and reptiles (and egg masses) may be lost during these activities. Potential impacts of these activities on individual amphibians and reptiles are similar to those described above for floodwalls, levee modifications, and maintenance road modifications. However, as noted for fish above, levee modifications and placement of rock slope protection can also have benefits on habitat for amphibians and reptiles. By reducing erosion and resulting sediment inputs into streams, levee modifications and placement of rock slope protection may result in a long-term beneficial impact on aquatic habitat quality for amphibians and reptiles. In addition, the installation of rock slope protection could potentially provide escape cover for reptiles and amphibians moving along the channels, a beneficial impact.

In accordance with BMP BI-2, the District may capture and relocate native amphibians and reptiles before the initiation of activities that would require temporary water diversions or dewatering. Amphibians and reptiles that were relocated to suitable habitat outside of the work site may be subjected to physiological stress and be at greater risk of predation, and dewatering activities may result in a temporary loss of habitat, blockage of movement, and stranding or death of amphibian eggs and larvae.

Birds. Potential impacts of bridge/culvert modifications, levee modifications, rock slope protection, and sediment removal activities on birds would be similar to those described above for floodwalls, and maintenance road modifications.

Mammals. Potential impacts of bridge/culvert modifications, levee modifications, rock slope protection, and sediment removal activities on mammals would be similar to those described above for floodwalls and maintenance road modifications. These effects would occur primarily in non-instream areas, as most mammals in the Project Area would be terrestrial. However, the installation of rock slope protection could also potentially provide escape cover for small mammals, moving along the channels, a beneficial impact.

Invertebrates. Bridge/culvert modifications, levee modifications, rock slope protection, and sediment removal construction activities often necessitate the operation of heavy equipment within the stream bed (after dewatering). Movement of heavy equipment may compact the substrate, potentially killing benthic invertebrates, embedding gravel within finer sediments, and otherwise altering habitat conditions. Other effects of these activities on invertebrates would be similar to those described above for floodwalls and maintenance road improvements.

Environmental Impacts

Note that impact discussions are structured to first present the potential environmental changes under the Proposed Project and the level of significance of environmental impacts. The discussion then presents applicable District BMPs that would avoid or minimize the level of impact. With consideration of the District BMPs, the significance of

the environmental impact is restated. If the impact would still be significant, MMs are prescribed. Lastly, the impact conclusion is stated after consideration of District BMPs and MMs.

Wetlands and Other Waters Impacts

Impact BIO-1: Loss or Temporary Disturbance of Wetlands and Other Waters – Less than Significant with Mitigation

Construction activities associated with the Proposed Project would result in both temporary and permanent disturbance to wetland and aquatic communities, including both jurisdictional and non-jurisdictional wetlands and other waters. Wetlands often serve a variety of important functions, such as sediment stabilization, sediment/toxicant retention, nutrient removal/transformation, and aquatic and terrestrial wildlife species habitat. As described above, the aquatic and wetland habitats within the Sunnyvale Channels are of relatively low quality as entirely constructed linear flood control channels. Nevertheless, wetland and aquatic habitats in these channels are important within the urban matrix of the Project vicinity, and habitat quality in the more well-vegetated lower, tidal reaches of these channels is even higher.

As described above under *Determination of Impacts on Aquatic and Wetland Communities*, Project activities could result in the hydrologic interruption (e.g., dewatering or diversion), vegetation removal, degradation of water quality (e.g., increased sedimentation and turbidity), and other temporary direct impacts on wetlands and other waters. Sediment would be removed from four locations along the East Channel and one location on the West, totaling approximately 0.17 mile of sediment removal (approximately 1,460 cubic yards). In total, the Project would result in 0.72 acre of direct temporary impacts on wetlands and other waters. These impacts include 0.46 acre of temporary impacts to tidal wetlands and waters, and 0.26 acre of temporary impacts to non-tidal wetlands and waters.

Permanent losses would occur due to placement of rock or concrete on the bed of 2,180 linear feet of existing earthen channel, placement of rock on the bed and one bank of 646 linear feet of existing earthen channel, and placement of rock on the bed and both banks of 11,291 linear feet of existing earthen channel. Permanent losses would also occur as a result of slight extensions of existing culverts and wingwalls. These impacts are considered permanent because they would result in the replacement of wetland and aquatic habitat by rock or concrete. In total, the Project would result in 3.90 acres of direct permanent impacts on wetlands and other waters. These impacts include 0.21 acre of permanent impacts to tidal wetlands and waters, and 3.69 acres of permanent impacts to non-tidal wetlands and waters. Nevertheless, levee modifications and placement of rock slope protection would result in some long-term improvement of water quality in wetlands and other waters by reducing erosion and resulting sediment inputs.

However, this beneficial impact would be offset to some extent by a reduction in vegetated wetlands, which provide sediment-holding services.

Applicable Best Management Practices

The District would implement the following BMPs when performing any type of activity that would necessitate work within or adjacent to the active channel. A description of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BIO-4: Minimize Waterway Access Impacts

BMP BIO-5: Remove Temporary Fills as Appropriate

BMP BIO-13: Plant Local Ecotypes of Native Plants and Choose Appropriate Erosion-Control Seed Mixes

BMP HM-9: Clean Vehicles and Equipment

BMP HM-10: Assure Proper Vehicle and Equipment Fueling

BMP HM-11: Assure Proper Vehicle and Equipment Maintenance

BMP HM-13: Prevent Spills

BMP HM-12: Know the Spill Kit Location

BMP WQ-1: Conduct Work from Top of Bank

BMP WQ-2: Evaluate Use of Wheel and Track Mounted Vehicles in Stream Bottoms

BMP WQ-3: Assess Pump/Generator Set Operations and Maintenance

BMP WQ-4: Handle Sediments so as to Minimize Water Quality Impacts

BMP WQ-5: Avoid Runoff from Soil Stockpiles

BMP WQ-6: Stabilize Construction Entrances and Exits

BMP WQ-7: Prevent Erosion Downstream of Bank Protection Sites

BMP WQ-9: Minimize Local Erosion Increase from In-channel Vegetation Removal

BMP WQ-10: Evaluate and Select the Most Appropriate Use of Concrete Near Waterways

BMP WQ-11: Use Cofferdams for Tidal Work Areas

BMP WQ-12: Divert/ Bypass Water at Non-tidal Sites

BMP WQ-13: Minimize Hardscape in Bank Protection Design

BMP WQ-14: Use Temporary Seeding for Erosion Control As Appropriate

BMP WQ-15: Manage Groundwater At Work Sites

BMP WQ-16: Avoid Erosion When Restoring Flows

- BMP WQ-17: Prevent Scour Downstream of Sediment Removal
- BMP WQ-18: Maintain Clean Conditions at Work Sites
- BMP WQ-19: Control Emergency Discharges
- BMP WQ-20: Control Unplanned Discharges
- BMP WQ-21: Control Sediment/ Turbidity for Discharges Less than 50 NTU
- BMP WQ-22: Control Sediment/ Turbidity for Discharge Greater than 50 NTU
- BMP WQ-23: Evaluate Use of Flow Path – Vegetation Filtration
- BMP WQ-24: Evaluate Use of Flow Path – Check Filters
- BMP WQ-25: Evaluate Use of On-Line Filter Systems
- BMP WQ-26: Evaluate Use of Silt Fence Culvert Entrance Protection
- BMP WQ-27: Evaluate Use of Surface Protection - Armoring
- BMP WQ-28: Evaluate Use of Surface Protection – Flow Diversion
- BMP WQ-30: Evaluate Use of Discharging to Sanitary Sewer System
- BMP WQ-40: Prevent Water Pollution
- BMP WQ-41: Prevent Stormwater Pollution
- BMP WQ-42: Prevent Sedimentation of Aquatic Habitats During Construction

Conclusion

Water quality and habitat values in unvegetated aquatic habitats subject to temporary disturbance are expected to quickly return to pre-construction conditions following the completion of Project activities. Thus, no mitigation is necessary for temporary impacts to unvegetated aquatic habitats. Even in vegetated wetlands, recolonization may occur relatively quickly. For example, according to the *Instream Wetland Vegetation Regrowth Study* (Rankin and Hillman 2000), many vegetated wetland areas would restore themselves within 1 to 2 years following sediment removal or other disturbances. Further, implementation of the BMPs listed above would minimize changes to water quality by reducing erosion, controlling sediment and preventing spills. Nevertheless, the Proposed Project would result in temporal loss of habitat functions and values, provided by vegetated wetlands, such as sediment stabilization, sediment/toxicant retention, nutrient removal/transformation, and aquatic and terrestrial wildlife species habitat. Thus, in the absence of any mitigation measures, temporary impacts on vegetated wetlands is considered potentially significant because it could result in the temporal loss of ecologically valuable habitat (Significance Criteria B and C).

The Proposed Project would also result in permanent losses of both vegetated wetlands and unvegetated aquatic habitats, including jurisdictional wetlands and other waters, that are ecologically valuable both in the Project Area and (in the case of the higher-quality tidal brackish wetlands) on the scale of the South Bay. Thus, permanent impacts on

both vegetated wetlands and unvegetated aquatic habitats are considered significant (Significance Criteria B and C). Impacts on special-status wildlife species resulting from disturbance or loss of wetland and aquatic habitat are addressed in separate impact discussions below.

Mitigation Measure BIO-1 would be implemented to reduce residual impacts on wetlands and aquatic habitats to a less-than-significant level by compensating for temporary impacts on vegetated wetlands and permanent impacts on both vegetated wetlands and unvegetated aquatic habitats.

Mitigation Measure BIO-1: Implement Compensatory Mitigation for Temporal Loss of Vegetated Wetlands and Permanent Loss of Vegetated and Unvegetated Wetlands and Other Waters

Mitigation for temporary impacts on vegetated wetlands and permanent impacts on both vegetated wetlands and unvegetated aquatic habitats shall be provided at a ratio of 1:1 (1 acre of mitigation for every 1 acre of disturbed) via creation or restoration of wetlands/other waters. Mitigation may be achieved through one or more options, potentially including (but not limited to):

- onsite restoration or creation of wetlands or aquatic habitats (including removal of onsite fill) if feasible onsite restoration opportunities exist;
- offsite restoration/creation of wetlands;
- financial contribution to restoration programs for tidal wetland restoration, such as the South Bay Salt Pond (SBSP) Restoration Project; and/or
- purchase of mitigation credits at approved mitigation banks within the San Francisco Bay Region.

Impacts on non-tidal vs. tidal wetlands and aquatic habitats would be mitigated in-kind with respect to tidal condition (i.e., impacts on non-tidal wetlands would be mitigated through restoration/preservation of non-tidal wetlands and impacts on tidal wetlands would be mitigated through restoration/preservation of tidal wetlands).

If the District restores wetlands onsite or offsite, a qualified biologist selected by the District will develop a Wetland and Jurisdictional Waters Mitigation and Monitoring Plan, which shall contain the following components (or as otherwise modified by regulatory agency permitting conditions):

1. Summary of habitat impacts and proposed mitigation ratios.
2. Goal of the restoration to achieve no net loss of habitat functions and values.
3. Location of mitigation site(s) and description of existing site conditions.
4. Mitigation design:

- Existing and proposed site hydrology
 - Grading plan if appropriate, including bank stabilization or other site stabilization features
 - Soil amendments and other site preparation elements as appropriate
 - Planting plan
 - Irrigation and maintenance plan
 - Remedial measures/adaptive management, etc.
5. Monitoring plan (including final and performance criteria, monitoring methods, data analysis, reporting requirements, monitoring schedule, etc.). At a minimum, success criteria will include quantifiable measurements of wetland vegetation type (e.g., dominance by native hydrophytes) and extent appropriate for the wetland restoration location, and provision of ecological functions and values equal to or exceeding those in the wetlands and waters that are impacted.
6. Contingency plan for mitigation elements that do not meet performance or final success criteria.

The District shall implement the Wetland and Jurisdictional Waters Mitigation Monitoring Plan. Monitoring shall be conducted annually to document whether the success criteria are achieved, and to identify any remedial actions that must be taken if the identified success criteria are not met. Monitoring shall continue until the mitigation has been determined to be successful per project permit requirements (i.e., success criteria are achieved).

Implementation of MM BIO-1 would result in the creation, restoration, and/or enhancement of wetlands, and would reduce this potential impact to a less-than-significant level.

Aquatic Species Impacts

Impact BIO-2: Impacts on Green Sturgeon, Steelhead, and Longfin Smelt – Less than Significant with Mitigation

Longfin smelt (state listed as threatened), green sturgeon (federally listed as threatened and a California species of special concern), and Central California Coast steelhead (federally listed as threatened) could potentially occur in the tidal reaches of the Sunnyvale Channels infrequently and/or in low numbers (refer to Table 3.3-2 above). None of these species is expected to spawn in the Project Area; however, foraging juvenile and adult green sturgeon may be present infrequently and in low numbers, and small numbers of steelhead and longfin smelt may occasionally stray onto the Project Area. If these species were to occur in the Project Area, their presence would be limited

to tidally influenced areas of the Sunnyvale Channels, which occur on the West Channel downstream of Mathilda Avenue and on the East Channel downstream of the SR 237 crossing.

Floodwalls, Maintenance Road Modifications, Levee Enlargement,

Floodwall installation and maintenance road modifications are proposed along the majority of the tidally influenced reaches of both the Sunnyvale Channels, potentially resulting in impacts on green sturgeon, steelhead, and longfin smelt due to increased erosion, sedimentation, and minor spills as described under *Determination of Impacts on Wildlife and Fisheries*, above. However, BMPs listed under Impact BIO-1 above would minimize such effects.

Bridge/Culvert Modifications, Rock Slope Protection, Sediment Removal

The proposed Project has been designed to minimize impacts on the tidally influenced portion of the Sunnyvale Channels to the extent feasible. However, some in-channel work is proposed within the tidally influenced portion of the East Channel, including the bridge/culvert modification at Caribbean Drive, sediment removal immediately south of Tasman Drive, and the installation of rock slope protection at the uppermost extent of tidally influenced habitat (i.e., upstream of Tasman Drive). The District would dewater these reaches prior to construction to facilitate bridge replacement, sediment removal in approximately 15 linear feet of the channel, and rock placement within approximately 829 linear feet of the channel. Within the West Channel, proposed instream activities include bridge/culvert enlargement at the uppermost end of the area of tidal influence (i.e., at Carl Road). Channel regrading and excavation (refer to Figure 2-7 in Chapter 2, "Project Description") for levee enlargement are also proposed in the tidally influenced area between Carl Road and Caribbean drive, as is sediment removal. The District would dewater this reach prior to construction to facilitate excavation and regrading of approximately 560 linear feet of the channel.

If these species were to occur in the reaches to be dewatered, dewatering activities could result in the injury or mortality of individuals as generally described under *Determination of Impacts on Wildlife and Fisheries*, above. However, sediments are expected to re-accumulate rapidly in this reach of the Project Area (Zedler pers. comm.), and this habitat is expected to rapidly re-establish following the completion of construction activities. The *Instream Wetland Vegetation Regrowth Study* (Rankin and Hillman 2000) found 65 percent and 98 percent average regrowth within 1 and 2 years, respectively, after 1997 sediment removal at six non-tidal freshwater study sites. Average regrowth on two tidal study sites was less, at 21 percent and 29 percent after one and two years, respectively. Regrowth study results on four additional 1998 sediment removal sites found that after one year, those sites supported more non-tidal wetland than was present before sediment removal and almost 70 percent of the tidal wetland that was present before sediment removal. Thus, the levee enlargement on the West Channel and sediment removal on the East and West Channels are not expected

to result in a substantial long-term change in the amount or suitability of aquatic habitat available to green sturgeon, steelhead, and longfin smelt. Nevertheless, the levee enlargement would increase the area of both banks (see Figure 2-7), providing additional area where new instream vegetation could develop during the post-Project condition.

Replacement of the natural bank upstream of Tasman Drive on the East Channel with rock that is not conducive to revegetation could result in an adverse effect on habitat for the green sturgeon, CCC steelhead, and longfin smelt. However, because spawning and juvenile rearing are not expected to occur in the Project Area, the impact would be limited primarily to a decrease in the availability of escape cover, the loss of refugia during high flows, and a loss of substrate used for foraging. Further, because addition of rock slope protection would only occur at the uppermost extent of tidally influence habitat, this impact is not expected to have a significant adverse effect on habitat for these species. Further, the installation of rock slope protection would eliminate or reduce existing erosion and improve the long-term channel slope stability, thereby reducing the potential for additional or new erosion from the sites in the future, which is a potential long-term beneficial impact on green sturgeon, CCC steelhead, and longfin smelt.

Although these species are expected to occur infrequently and in low numbers, if at all, in the Project Area, the Project would result in permanent impacts on approximately 0.21 acre of tidal habitat and temporary impacts on approximately 0.46 acre of tidal habitat in which these species could potentially occur (see **Figures 3.3-2a** through **3.3-3i** in **Appendix P**). These activities could affect the primary constituent elements (PCEs) of critical habitat involving food resources, water quality, and sediment quality for the green sturgeon and the PCEs involving estuarine water quality, natural cover, and juvenile and adult foraging habitat for CCC steelhead within these waters as well, although again, such habitat contributes little to green sturgeon and CCC steelhead survival and recovery given the infrequency with which these species might occur in the Project Area.

Applicable Best Management Practices

The District would implement the following BMPs when performing any type of activity that would necessitate work within or adjacent to the active channel. A description of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BIO-2: Avoid and Minimize Impacts on Native Aquatic Vertebrates

BMP BIO-3: Minimize Impacts to Steelhead

BMP BIO-4: Minimize Waterway Access Impacts

BMP BIO-5: Remove Temporary Fills as Appropriate

BMP BIO-13: Plant Local Ecotypes of Native Plants and Choose Appropriate Erosion-Control Seed Mixes

BMP BIO-14: Maintain Low-Flow Fish Passage

- BMP BIO-15: Restore Riffle/Pool Configuration of Channel Bottom
- BMP HM-13: Prevent Spills
- BMP HM-15: Avoid Exposing Soils with High Mercury Levels
- BMP HM-9: Clean Vehicles and Equipment
- BMP HM-10: Assure Proper Vehicle and Equipment Fueling
- BMP HM-11: Assure Proper Vehicle and Equipment Maintenance
- BMP HM-13: Prevent Spills
- BMP HM-12: Know the Spill Kit Location
- BMP WQ-1: Conduct Work from Top of Bank
- BMP WQ-2: Evaluate Use of Wheel and Track Mounted Vehicles in Stream Bottoms
- BMP WQ-3: Assess Pump/Generator Set Operations and Maintenance
- BMP WQ-4: Handle Sediments so as to Minimize Water Quality Impacts
- BMP WQ-5: Avoid Runoff from Soil Stockpiles
- BMP WQ-6: Stabilize Construction Entrances and Exits
- BMP WQ-7: Prevent Erosion Downstream of Bank Protection Sites
- BMP WQ-9: Minimize Local Erosion Increase from In-channel Vegetation Removal
- BMP WQ-10: Evaluate and Select the Most Appropriate Use of Concrete Near Waterways
- BMP WQ-11: Use Cofferdams for Tidal Work Areas
- BMP WQ-12: Divert/ Bypass Water at Non-tidal Sites
- BMP WQ-13: Minimize Hardscape in Bank Protection Design
- BMP WQ-14: Use Temporary Seeding for Erosion Control As Appropriate
- BMP WQ-15: Manage Groundwater At Work Sites
- BMP WQ-16: Avoid Erosion When Restoring Flows
- BMP WQ-17: Prevent Scour Downstream of Sediment Removal
- BMP WQ-18: Maintain Clean Conditions at Work Sites
- BMP WQ-19: Control Emergency Discharges
- BMP WQ-20: Control Unplanned Discharges
- BMP WQ-21: Control Sediment/ Turbidity for Discharges Less than 50 NTU
- BMP WQ-22: Control Sediment/ Turbidity for Discharge Greater than 50 NTU

- BMP WQ-23: Evaluate Use of Flow Path – Vegetation Filtration
- BMP WQ-24: Evaluate Use of Flow Path – Check Filters
- BMP WQ-25: Evaluate Use of On-Line Filter Systems
- BMP WQ-26: Evaluate Use of Silt Fence Culvert Entrance Protection
- BMP WQ-27: Evaluate Use of Surface Protection - Armoring
- BMP WQ-28: Evaluate Use of Surface Protection – Flow Diversion
- BMP WQ-30: Evaluate Use of Discharging to Sanitary Sewer System
- BMP WQ-40: Prevent Water Pollution
- BMP WQ-41: Prevent Stormwater Pollution
- BMP WQ-42: Prevent Sedimentation of Aquatic Habitats during Construction

Conclusion

Implementation of the BMPs listed above would minimize changes to water quality by reducing erosion, controlling sediment and preventing spills. By implementing these BMPs, the District is expected to be able to minimize impacts to green sturgeon, steelhead, and longfin smelt. Nevertheless, the Project would result in residual impacts on these species because complete avoidance of individuals and loss of potential habitat could not be accomplished while still meeting the Project goals. As a result, this impact is considered potentially significant. The District would implement the following MMs to reduce impacts to green sturgeon, steelhead, and longfin smelt.

Mitigation Measure BIO-1: Implement Compensatory Mitigation for Temporal Loss of Vegetated Wetlands and Permanent Loss of Vegetated and Unvegetated Wetlands and Other Waters

Refer to Impact BIO-1 above for a detailed description of this measure.

Mitigation Measure BIO-2: Conduct Fish Removal during Project Site Dewatering Activities

Prior to dewatering activities in tidal reaches, a qualified biologist would use nets to exclude fish from the construction area. During a falling tide, a block net shall be placed at the upper end of the reach to be dewatered. Subsequently, qualified biologists shall walk from the upper to lower end of the reach with a net stretched across the channel to encourage fish to move out of the construction area. When the lower end of the construction area is reached, a second block net shall be installed to isolate the construction reach. This procedure shall be repeated a minimum of three times per dewatered tidal reach to assure no green sturgeon, steelhead, or longfin smelt remain within the construction area. Mesh size shall not exceed 9.5 mm to ensure that longfin smelt are adequately excluded from this area.

Implementation of MM BIO-1 would result in the creation, restoration, and/or enhancement of tidal habitat for these fish species, which would compensate for any permanent loss of tidal habitat. Impacts on non-tidal and tidal wetlands and other waters would be mitigated in-kind with respect to tidal condition (i.e., impacts on non-tidal wetlands would be mitigated through restoration/preservation of non-tidal wetlands and impacts on tidal wetlands would be mitigated through restoration/preservation of tidal wetlands). However, to the extent these species occur during construction, impacts to individuals of these species would still be significant because of their regional rarity. Implementation of MM BIO-2 would minimize the potential for loss of individual green sturgeon, steelhead, or longfin smelt, and would reduce this impact to a less-than-significant level.

Impact BIO-3: Impacts on Non-Special Status Fish and Amphibians – Less than Significant

Several species of non-special-status amphibians, such as the western toad and Pacific chorus frog, use the Project Area as breeding and foraging habitat. In addition to the special status fish mentioned under *Impact BIO-2: Impacts on Green Sturgeon, Steelhead, and Longfin Smelt*, native fish such as the California roach and Sacramento sucker are present in the Sunnyvale Channels. Although suitable spawning habitat for Central Valley fall-run Chinook salmon is absent from the Sunnyvale Channels, small numbers of the fall-run Chinook salmon may forage in the Sunnyvale Channels in tidally influenced areas downstream of Mathilda Avenue along the West Channel and the SR 237 crossing of the East Channel. However, these stray individuals are expected to occur irregularly and in extremely low numbers. Further, genetic analysis has confirmed that Chinook in South Bay streams are all derived from hatchery stock (Hedgecock 2002), and therefore do not represent a native run in the South Bay. Thus, Chinook and non-special-status amphibians and fish are assessed together in the remainder of this impact, as Project-related impacts on these species are expected to be similar.

Proposed Project activities, especially instream activities requiring dewatering (i.e., sediment removal, installation of rock slope protection, and levee enlargement) would impact non-special-status fish and amphibians in the Project Area in ways described under *Determination of Impacts to Wildlife and Fisheries*. The non-special-status fish and amphibians that would be impacted by the Project are relatively abundant and widespread, with the exception of the Chinook salmon, which is not native to South San Francisco Bay streams. As a result, the injury or mortality of individuals potentially occurring within the Project Area due to Project activities would not result in a substantial effect on regional populations of these species.

Applicable Best Management Practices

The District would implement the following BMPs when performing any type of activity that would necessitate work within or adjacent to the active channel. A description of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BIO-2: Avoid and Minimize Impacts on Native Aquatic Vertebrates

BMP BIO-3: Minimize Impacts to Steelhead

BMP BIO-4: Minimize Waterway Access Impacts

BMP BIO-5: Remove Temporary Fills as Appropriate

BMP BIO-13: Plant Local Ecotypes of Native Plants and Choose Appropriate Erosion-Control Seed Mixes

BMP BIO-14: Maintain Low-Flow Fish Passage

BMP BIO-15: Restore Riffle/Pool Configuration of Channel Bottom

BMP HIM-13: Prevent Spills

BMP HIM-15: Avoid Exposing Soils with High Mercury Levels

BMP HM-9: Clean Vehicles and Equipment

BMP HM-10: Assure Proper Vehicle and Equipment Fueling

BMP HM-11: Assure Proper Vehicle and Equipment Maintenance

BMP HM-13: Prevent Spills

BMP HM-12: Know the Spill Kit Location

BMP WQ-1: Conduct Work from Top of Bank

BMP WQ-2: Evaluate Use of Wheel and Track Mounted Vehicles in Stream Bottoms

BMP WQ-3: Assess Pump/Generator Set Operations and Maintenance

BMP WQ-4: Handle Sediments so as to Minimize Water Quality Impacts

BMP WQ-5: Avoid Runoff from Soil Stockpiles

BMP WQ-6: Stabilize Construction Entrances and Exits

BMP WQ-7: Prevent Erosion Downstream of Bank Protection Sites

BMP WQ-9: Minimize Local Erosion Increase from In-channel Vegetation Removal

BMP WQ-10: Evaluate and Select the Most Appropriate Use of Concrete Near Waterways

BMP WQ-11: Use Cofferdams for Tidal Work Areas

BMP WQ-12: Divert/ Bypass Water at Non-tidal Sites

BMP WQ-13: Minimize Hardscape in Bank Protection Design

BMP WQ-14: Use Temporary Seeding for Erosion Control As Appropriate

BMP WQ-15: Manage Groundwater At Work Sites

BMP WQ-16: Avoid Erosion When Restoring Flows

- BMP WQ-17: Prevent Scour Downstream of Sediment Removal
- BMP WQ-18: Maintain Clean Conditions at Work Sites
- BMP WQ-19: Control Emergency Discharges
- BMP WQ-20: Control Unplanned Discharges
- BMP WQ-21: Control Sediment/ Turbidity for Discharges Less than 50 NTU
- BMP WQ-22: Control Sediment/ Turbidity for Discharge Greater than 50 NTU
- BMP WQ-23: Evaluate Use of Flow Path – Vegetation Filtration
- BMP WQ-24: Evaluate Use of Flow Path – Check Filters
- BMP WQ-25: Evaluate Use of On-Line Filter Systems
- BMP WQ-26: Evaluate Use of Silt Fence Culvert Entrance Protection
- BMP WQ-27: Evaluate Use of Surface Protection - Armoring
- BMP WQ-28: Evaluate Use of Surface Protection – Flow Diversion
- BMP WQ-30: Evaluate Use of Discharging to Sanitary Sewer System
- BMP WQ-40: Prevent Water Pollution
- BMP WQ-41: Prevent Stormwater Pollution
- BMP WQ-42: Prevent Sedimentation of Aquatic Habitats During Construction

Conclusion

Implementation of the BMPs listed above would minimize changes to water quality by reducing erosion, controlling sediment and preventing spills. Implementation of these BMPs would be adequate to assure that the impact on Chinook salmon and non-special-status amphibians and fish would be less than significant.

Impact BIO-4: Impacts on Essential Fish Habitat – Less than Significant

As noted in *Section 3.3.2, Regulatory Setting*, the Chinook salmon, which is regulated by the Pacific Fishery Management Council's Pacific Coast Salmon FMP (Pacific Fishery Management Council 1999), may occur irregularly in the Project Area. Although the Chinook salmon in the Project Area have been recognized as strays from hatchery releases (NMFS 1999; Hedgecock 2002), NMFS still considers habitat used by Chinook salmon in the South Bay as EFH. Thus, tidally influenced portions of the Project Area (i.e., downstream of the SR 237 crossing of the East Channel, and downstream of Java Drive within the West Channel) could be considered EFH associated with the Pacific Coast Salmon FMP.

Several fish species regulated by the Pacific Groundfish FMP (Pacific Fishery Management Council 2008), such as the leopard shark, English sole, starry flounder, and big skate, occur in tidal habitats of South San Francisco Bay and occasionally

disperse upstream into the reaches of the Guadalupe Slough and the Sunnyvale Channels. Fish regulated by the Coastal Pelagics Fisheries Management Plan (Pacific Fishery Management Council 1998), such as the northern anchovy, Pacific sardine, and jack mackerel also occur in the South Bay, and they could possibly occur in the tidal portions of the Project Area. Because of the presence of at least some species managed by one of these plans, tidally influenced portions of the Project Area are considered EFH associated with the Pacific Groundfish and Coastal Pelagics FMPs.

The types of effects that Project activities could have on these species and the associated EFH that would support them are the same as those described above under *Impact BIO-2: Impacts on Green Sturgeon, Steelhead, and Longfin Smelt*. Accordingly, Project activities would have limited effects on potential EFH in tidal waters as the Proposed Project has been designed to minimize impacts on the tidally influenced portion of the Sunnyvale Channels to the extent feasible. However, such impacts may occur because of excavation associated with levee enlargement and sediment removal on the West Channel between Carl Road and Caribbean Drive and bridge/culvert modifications on the West Channel at Carl Road and on the East Channel at Caribbean Drive. During such activities, turbidity may increase, potentially affecting the health or foraging ability of fish in tidal waters.

Removal of wetland vegetation in and adjacent to tidally influence sloughs and channels would result in a minor loss of EFH. Although bridge/culvert modifications would include only a very small amount of tidal channel that is not already impacted, excavation of the West Channel between Carl Road and Caribbean Drive would result in the temporary disturbance of approximately 560 linear feet of EFH. However, as described under *Impact BIO-2: Impacts on Green Sturgeon, Steelhead, and Longfin Smelt*, aquatic and wetland habitat within this reach is expected to re-establish following the completion of construction activities.

Applicable Best Management Practices

The District would implement the following BMPs when performing any type of activity that would necessitate work within or adjacent to the active channel. A description of each BMP is provided in Chapter 2, "Project Description."

BMP BIO-2: Avoid and Minimize Impacts on Native Aquatic Vertebrates

BMP BIO-4: Minimize Waterway Access Impacts

BMP BIO-5: Remove Temporary Fills as Appropriate

BMP BIO-13: Plant Local Ecotypes of Native Plants and Choose Appropriate Erosion-Control Seed Mixes

BMP BIO-14: Maintain Low-Flow Fish Passage

BMP BIO-15: Restore Riffle/Pool Configuration of Channel Bottom

BMP HIM-13: Prevent Spills

- BMP HIM-15: Avoid Exposing Soils with High Mercury Levels
- BMP HM-9: Clean Vehicles and Equipment
- BMP HM-10: Assure Proper Vehicle and Equipment Fueling
- BMP HM-11: Assure Proper Vehicle and Equipment Maintenance
- BMP HM-13: Prevent Spills
- BMP HM-12: Know the Spill Kit Location
- BMP WQ-1: Conduct Work from Top of Bank
- BMP WQ-2: Evaluate Use of Wheel and Track Mounted Vehicles in Stream Bottoms
- BMP WQ-3: Assess Pump/Generator Set Operations and Maintenance
- BMP WQ-4: Handle Sediments so as to Minimize Water Quality Impacts
- BMP WQ-5: Avoid Runoff from Soil Stockpiles
- BMP WQ-6: Stabilize Construction Entrances and Exits
- BMP WQ-7: Prevent Erosion Downstream of Bank Protection Sites
- BMP WQ-9: Minimize Local Erosion Increase from In-channel Vegetation Removal
- BMP WQ-10: Evaluate and Select the Most Appropriate Use of Concrete Near Waterways
- BMP WQ-11: Use Cofferdams for Tidal Work Areas
- BMP WQ-12: Divert/ Bypass Water at Non-tidal Sites
- BMP WQ-13: Minimize Hardscape in Bank Protection Design
- BMP WQ-14: Use Temporary Seeding for Erosion Control As Appropriate
- BMP WQ-15: Manage Groundwater At Work Sites
- BMP WQ-16: Avoid Erosion When Restoring Flows
- BMP WQ-17: Prevent Scour Downstream of Sediment Removal
- BMP WQ-18: Maintain Clean Conditions at Work Sites
- BMP WQ-19: Control Emergency Discharges
- BMP WQ-20: Control Unplanned Discharges
- BMP WQ-21: Control Sediment/ Turbidity for Discharges Less than 50 NTU
- BMP WQ-22: Control Sediment/ Turbidity for Discharge Greater than 50 NTU
- BMP WQ-23: Evaluate Use of Flow Path – Vegetation Filtration
- BMP WQ-24: Evaluate Use of Flow Path – Check Filters

BMP WQ-25: Evaluate Use of On-Line Filter Systems

BMP WQ-26: Evaluate Use of Silt Fence Culvert Entrance Protection

BMP WQ-27: Evaluate Use of Surface Protection - Armoring

BMP WQ-28: Evaluate Use of Surface Protection – Flow Diversion

BMP WQ-30: Evaluate Use of Discharging to Sanitary Sewer System

BMP WQ-40: Prevent Water Pollution

BMP WQ-41: Prevent Stormwater Pollution

BMP WQ-42: Prevent Sedimentation of Aquatic Habitats During Construction

Conclusion

Implementation of the BMPs listed above would minimize changes to water quality by reducing erosion, controlling sediment and preventing spills. Due to the very limited extent of impacts to tidal waters that could serve as EFH, and particularly the limited extent of permanent impacts, the loss of EFH and associated effects on fish species regulated by FMPs would be very low. Implementation of BMPs would further reduce impacts on EFH and associated fish species considerably. With implementation of these BMPs, the Project would affect only a very small proportion of EFH and associated species in the South San Francisco Bay, and thus the Project would not have a substantial effect on these resources. Therefore, Project impacts on EFH are considered less than significant.

Although no mitigation would be needed to reduce impacts to EFH to less-than-significant levels, mitigation measures for other impacts would benefit EFH and associated species. As discussed under Impact BIO-1, Mitigation Measure BIO-1 would require the District to provide compensatory mitigation for impacts on wetland and aquatic habitats. Mitigation Measure BIO-1 would result in benefits to fish managed by the aforementioned FMPs through tidal wetland and aquatic habitat restoration, enhancement, and protection, which would compensate for impacts to habitat for these species. In addition, Mitigation Measure BIO-2 would minimize the potential for the loss of any FMP-managed species by moving individuals out of the dewatering areas for work in tidal habitats.

Impact BIO-5: Impacts on Western Pond Turtles – Less than Significant with Mitigation

Suitable habitat for the western pond turtle, a California species of special concern, consists of ponds or instream pools (i.e., slack water environments) with available basking sites, nearby upland areas with clay or silty soils for nesting, and shallow aquatic habitat with emergent vegetation and invertebrate prey for juveniles (Jennings and Hayes 1994). A small population of western pond turtles is known to be present within the Lockheed Channel and North Moffett Channel west of the Sunnyvale West Channel (TN & Associates, Inc. and Tetra Tech EC, Inc. 2006 as cited in EDAW 2007).

Consequently, it is likely that small numbers of western pond turtles occur in the Sunnyvale Channels (H. T. Harvey & Associates 2012b), especially in the northern portion of the West Channel given its hydrological connection to North Moffett Channel. However, given that no western pond turtles were observed in these lower portions of the Sunnyvale Channels during a focused survey for the species in 2012 (H. T. Harvey & Associates 2012b), and given that urbanization likely precludes the maintenance of a viable population in the upper portions of these channels, western pond turtles are expected to occur in the Sunnyvale Channels infrequently and in low numbers.

As described under *Determination of Impacts to Wildlife and Fisheries*, Project activities may affect aquatic habitat used by western pond turtles for foraging or dispersal, upland habitat used for nesting, and/or individuals. For example, individual turtles or their eggs may be harmed or killed during Project activities due to crushing by construction personnel or equipment, or as a result of desiccation or burying (e.g., during sediment removal, installation of rock slope protection, or grading). In addition, the construction of floodwalls may create barriers to dispersal of turtles. Upstream from Caribbean Drive, western pond turtles are not able to disperse between the Sunnyvale Channels or to other water bodies, due to the barrier posed by the urban landscape lining both Sunnyvale Channels. To the extent that western pond turtles may disperse outside the channels downstream from Caribbean Drive, the construction of floodwalls along the lower reaches of these channels would impede movements in and out of the channels. It is also possible that turtles dispersing toward or away from these channels would encounter these walls and have to travel along these walls before reaching areas at either end of the floodwalls where they can again access the channels. However, these floodwalls would not prevent dispersal of turtles between the channels and other areas, as turtles can still move along the uplands and aquatic habitats north of the WPCP and old landfills.

Instream areas that provide foraging habitat for turtles may be temporarily lost during bridge/culvert modifications and levee widening (both of which are proposed in the northern portion of the West Channel) and sediment removal (proposed between Caribbean Drive and Carl Road on the West Channel). Dewatering activities (refer to BMPs identified for this impact, below) would also result in a temporary loss of aquatic habitat (up to 4.62 acres). However, dewatering activities would be phased over a two-year period, would only occur in the summer months of each construction year, and would only affect small areas of each channel at any time. Thus, given that this habitat is expected to be seldom used by small numbers of turtles, would continue to be suitable habitat following construction, and given the abundance of suitable aquatic habitat in the Project vicinity, temporary loss of aquatic habitat as a result of the Proposed Project is not expected to result in a substantial adverse effect on the western pond turtle population in the Project Area.

Sediment removal, channel excavation, and installation of concrete may reduce instream habitat structure, including basking areas, vegetation that provides concealment from

predators and habitat that supports turtle prey. The installation of rock in the channel could also result in impacts on turtles during installation; however, no rock installation is proposed in the northernmost portions of the channels where turtles are most likely to occur. Further, where rock is installed, it would provide some instream cover, habitat for prey, and basking areas for turtles.

Upland dispersal and nesting habitat for western pond turtles may be temporarily disturbed (up to 33.19 acres) or permanently lost (up to 4.89 acres) from construction of all Project components (see **Figures 3.3-2a** through **3.3-3i** in **Appendix P**). However, the temporary loss of instream aquatic habitat and upland dispersal and nesting habitat for pond turtles is not expected to have a substantial adverse effect, as this habitat is expected to be seldom used by small numbers of turtles and would continue to be suitable habitat following construction.

Applicable Best Management Practices

The District would implement the following BMPs when performing any type of Project activity that necessitates work within or adjacent to the active channel. A description of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BIO-2: Avoid and Minimize Impacts on Native Aquatic Vertebrates

BMP BIO-4: Minimize Waterway Access Impacts

BMP BIO-5: Remove Temporary Fills as Appropriate

BMP BIO-16: Avoid Animal Entry and Entrapment

BMP BIO-17: Minimize Predator-attraction Effects on Wildlife

BMP BIO-13: Plant Local Ecotypes of Native Plants and Choose Appropriate Erosion-Control Seed Mixes

BMP HM-9: Clean Vehicles and Equipment

BMP HM-10: Assure Proper Vehicle and Equipment Fueling

BMP HM-11: Assure Proper Vehicle and Equipment Maintenance

BMP HM-13: Prevent Spills

BMP HM-12: Know the Spill Kit Location

BMP WQ-1: Conduct Work from Top of Bank

BMP WQ-2: Evaluate Use of Wheel and Track Mounted Vehicles in Stream Bottoms

BMP WQ-3: Assess Pump/Generator Set Operations and Maintenance

BMP WQ-4: Handle Sediments so as to Minimize Water Quality Impacts

BMP WQ-5: Avoid Runoff from Soil Stockpiles

BMP WQ-6: Stabilize Construction Entrances and Exits

BMP WQ-7: Prevent Erosion Downstream of Bank Protection Sites

BMP WQ-9: Minimize Local Erosion Increase from In-channel Vegetation Removal

BMP WQ-10: Evaluate and Select the Most Appropriate Use of Concrete Near Waterways

BMP WQ-11: Use Cofferdams for Tidal Work Areas

BMP WQ-12: Divert/ Bypass Water at Non-tidal Sites

BMP WQ-13: Minimize Hardscape in Bank Protection Design

BMP WQ-14: Use Temporary Seeding for Erosion Control As Appropriate

BMP WQ-15: Manage Groundwater At Work Sites

BMP WQ-16: Avoid Erosion When Restoring Flows

BMP WQ-17: Prevent Scour Downstream of Sediment Removal

BMP WQ-18: Maintain Clean Conditions at Work Sites

BMP WQ-19: Control Emergency Discharges

BMP WQ-20: Control Unplanned Discharges

BMP WQ-21: Control Sediment/ Turbidity for Discharges Less than 50 NTU

BMP WQ-22: Control Sediment/ Turbidity for Discharge Greater than 50 NTU

BMP WQ-23: Evaluate Use of Flow Path – Vegetation Filtration

BMP WQ-24: Evaluate Use of Flow Path – Check Filters

BMP WQ-25: Evaluate Use of On-Line Filter Systems

BMP WQ-26: Evaluate Use of Silt Fence Culvert Entrance Protection

BMP WQ-27: Evaluate Use of Surface Protection - Armoring

BMP WQ-28: Evaluate Use of Surface Protection – Flow Diversion

BMP WQ-30: Evaluate Use of Discharging to Sanitary Sewer System

BMP WQ-40: Prevent Water Pollution

BMP WQ-41: Prevent Stormwater Pollution

BMP WQ-42: Prevent Sedimentation of Aquatic Habitats During Construction

Conclusion

Implementation of the BMPs listed above would minimize potential harm to western pond turtles during Project construction activities. Implementation of BMP BIO-2 may result in western pond turtles being relocated from the work site before the onset of construction activities. Individuals that are found during pre-activity surveys and

relocated to suitable habitat outside of the work site may be subjected to physiological stress and greater risk of predation, or may undergo increased competition with turtles already present in the area to which they were relocated. However, the benefits of such relocation, in terms of avoiding direct injury or mortality, would far outweigh any adverse effects.

Should western pond turtles be present in the work area, a qualified biologist would determine whether to relocate individuals. BMPs would also reduce the potential for entrapment and predation of turtles in work areas. However, the Proposed Project could still result in the loss of individuals or nests of western pond turtles. Western pond turtles are reclusive by nature, and they may be difficult to detect within the Project Work Area. Although BMP BIO-2 states that a qualified biologist would determine whether to relocate individuals from work areas where cofferdams, water bypass structures, and silt barriers are to be installed, it does not require surveys to be conducted prior to the initiation of work activities. If surveys to determine whether turtles are present are not performed, individuals may be missed and inadvertently killed by construction equipment or personnel. In addition, BMP BIO-2 does not require the Project to avoid impacts on western pond turtles, should they be present in work areas, but potentially allows work to occur when turtles are present in work areas. Should Project activities proceed when individuals are present, injury or mortality of individuals could occur.

Nests of western pond turtles could occur in upland habitats within the Project Area. Nests present in the Project Area may be inadvertently crushed by construction equipment or personnel, or buried during the movement or placement of materials or fill.

Although western pond turtles are widespread in the Project region, the species is not particularly abundant along the Sunnyvale East and West Channels. Because individuals of this species can be long-lived, the widespread nature of the species in the Project region may belie a population that likely would decline substantially in the future because of poor reproduction, as young turtles are seen in relatively few parts of the Project region. Therefore, the loss of individuals could reduce the viability of a population to the extent that it would be extirpated. Therefore, this impact is considered potentially significant. The District would implement the following MM to detect western pond turtles in the Project Area prior to beginning Project construction activities.

Mitigation Measure BIO-3: Conduct Pre-Construction Surveys for Western Pond Turtles

A qualified biologist shall conduct a survey for western pond turtles and their nests within 48 hours prior to commencement of work within the channel banks in any given area where water is present. If a western pond turtle is found in an area where it could be injured or killed by Project activities, the qualified biologist will relocate the turtle to an appropriate site outside the Project area (e.g., the Lockheed Channel or North Moffett Channel)

If an active western pond turtle nest is detected within the activity area, a 25 foot-buffer zone around the nest will be established and maintained during the nesting season (April 1 through August 31). The buffer zone will remain in place until the young have left the nest, as determined by a qualified biologist.

Following the initial survey, a construction crewmember who has been trained to identify western pond turtles by a qualified biologist shall conduct a survey of the in-channel activity area each morning prior to the onset of construction activities. If a turtle is located, all work in the vicinity shall immediately cease, and a qualified biologist shall be contacted. Work within the area shall not resume until the turtle has been relocated or has moved out of the area where it could be impacted.

Implementation of MM BIO-3 would further minimize the potential for loss of individual western pond turtles and their nests, and would reduce this impact to a less-than-significant level.

Terrestrial Species Impacts

Impact BIO-6: Impacts on the California Clapper Rail and California Black Rail – Less than Significant

The California clapper rail (a federally and state endangered species and a state fully protected species) and California black rail (a state threatened species and a state fully protected species) are both associated with salt/brackish marsh habitats in the San Francisco Bay area. Thus, these species are assessed together because potential Project-related impacts on these species would be similar.

Suitable nesting habitat for California clapper rails and black rails is not present in the Project Area or close enough to Project activities that nesting clapper or black rails would be disturbed by construction activities (H. T. Harvey & Associates 2011d). Thus, Project activities would not affect nesting habitat or nesting individuals of either species. Nevertheless, clapper rails may occasionally wander upstream from their typical salt marsh habitats into tidal brackish/freshwater marsh habitats in Guadalupe Slough, immediately adjacent to the Project Area, and both California clapper rails and black rails may occasionally wander into the Moffett Channel. However, they are expected to do so only very rarely and in low numbers (H. T. Harvey & Associates 2011d). Further, the West Channel upstream of its confluence with Moffett Channel and the entire East Channel lack suitable marsh habitat for use by these species.

Neither levee modifications, rock slope protection, nor sediment removal activities would impact suitable foraging habitat for clapper rails or black rails. Heavy ground disturbance, noise, and vibrations caused by proposed floodwall construction and levee raising activities along the West Channel near the Moffett Channel and along the East Channel near the confluence with Guadalupe Slough could potentially disturb foraging

clapper rails or black rails and cause them to move away from work areas, as described under *Determination of Impacts to Wildlife and Fisheries*, above. In addition, human-related disturbance during construction may increase the rails' vulnerability to predators, if rails are present. Clapper rail mortality is greatest during the winter, primarily because of predation during extreme winter high tides (Eddleman 1989, Albertson 1995). During high tides, rails and other wildlife hide within any available cover in the transition zone and high marsh, but as people approach, the birds may flush and attract predators. In addition, the presence of people in or near the high marsh plain or upland areas during marsh inundation may prevent clapper rails from leaving the lower marsh plain to seek cover, which also leaves them vulnerable to predation (Evens and Page 1983, Evens and Page 1986).

However, the only areas with any potential for use by California clapper rails or black rails in or near the Project Area are the lowermost reaches of work along the Sunnyvale East and West Channels at the confluence with Guadalupe Slough and Moffett Channel, respectively, where Project activities would occur on levees adjacent to tidal wetlands and not within the Channels. Occurrence by either rail species at these locations is extremely unlikely given the marginal quality of habitat, and would be limited to nonbreeding individuals. Moreover, existing disturbance in both areas exists in the form of extensive human recreational use of maintenance roads along the levees, further reducing the likelihood that rails would occur in these areas. Therefore, there is no reasonable expectation that California clapper rails and California black rails would be present in areas where they could be disturbed by construction.

Adverse effects from the Project to water quality and invertebrates could potentially reduce prey for these species, but given the infrequency with which either species would occur on or near the Project Area, there is little potential for the Project to adversely affect the health of a California clapper rail or California black rail, even in the absence of BMPs. The District would implement BMPs to reduce impacts on water quality (e.g., erosion and sediment control and spill prevention), further minimizing the potential for any adverse effects.

Applicable Best Management Practices

The District would implement the following BMPs during construction activities. A description of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BIO-4: Minimize Waterway Access Impacts

BMP BIO-5: Remove Temporary Fills as Appropriate

BMP BIO-13: Plant Local Ecotypes of Native Plants and Choose Appropriate Erosion-Control Seed Mixes

BMP HM-9: Clean Vehicles and Equipment

BMP HM-10: Assure Proper Vehicle and Equipment Fueling

- BMP HM-11: Assure Proper Vehicle and Equipment Maintenance
- BMP HM-13: Prevent Spills
- BMP HM-12: Know the Spill Kit Location
- BMP WQ-1: Conduct Work from Top of Bank
- BMP WQ-2: Evaluate Use of Wheel and Track Mounted Vehicles in Stream Bottoms
- BMP WQ-3: Assess Pump/Generator Set Operations and Maintenance
- BMP WQ-4: Handle Sediments so as to Minimize Water Quality Impacts
- BMP WQ-5: Avoid Runoff from Soil Stockpiles
- BMP WQ-6: Stabilize Construction Entrances and Exits
- BMP WQ-7: Prevent Erosion Downstream of Bank Protection Sites
- BMP WQ-9: Minimize Local Erosion Increase from In-channel Vegetation Removal
- BMP WQ-10: Evaluate and Select the Most Appropriate Use of Concrete Near Waterways
- BMP WQ-11: Use Cofferdams for Tidal Work Areas
- BMP WQ-12: Divert/ Bypass Water at Non-tidal Sites
- BMP WQ-13: Minimize Hardscape in Bank Protection Design
- BMP WQ-14: Use Temporary Seeding for Erosion Control As Appropriate
- BMP WQ-15: Manage Groundwater At Work Sites
- BMP WQ-16: Avoid Erosion When Restoring Flows
- BMP WQ-17: Prevent Scour Downstream of Sediment Removal
- BMP WQ-18: Maintain Clean Conditions at Work Sites
- BMP WQ-19: Control Emergency Discharges
- BMP WQ-20: Control Unplanned Discharges
- BMP WQ-21: Control Sediment/ Turbidity for Discharges Less than 50 NTU
- BMP WQ-22: Control Sediment/ Turbidity for Discharge Greater than 50 NTU
- BMP WQ-23: Evaluate Use of Flow Path – Vegetation Filtration
- BMP WQ-24: Evaluate Use of Flow Path – Check Filters
- BMP WQ-25: Evaluate Use of On-Line Filter Systems
- BMP WQ-26: Evaluate Use of Silt Fence Culvert Entrance Protection
- BMP WQ-27: Evaluate Use of Surface Protection - Armoring

BMP WQ-28: Evaluate Use of Surface Protection – Flow Diversion

BMP WQ-30: Evaluate Use of Discharging to Sanitary Sewer System

BMP WQ-40: Prevent Water Pollution

BMP WQ-41: Prevent Stormwater Pollution

BMP WQ-42: Prevent Sedimentation of Aquatic Habitats During Construction

Conclusion

The Project would not directly impact suitable habitat for either the California clapper rail or California black rail, and habitat adjacent to impact areas is of marginal quality, at best, to serve as foraging habitat. Due to the extremely low frequency with which these rails could possibly occur in areas adjacent to the Project Area, Project activities are highly unlikely to affect any individuals of either species. In addition, should an occasional rail happen to occur in areas adjacent to Project activities, because the Project Area is located at the southern terminus of contiguous marsh habitat, Project activities would not prevent these rails from moving away to seek cover or avoid disturbances. Thus, Project activities are not expected to adversely affect habitat of, or the health of, individual clapper rails or black rails, and Project-related impacts on clapper rails and black rails are considered to be less-than-significant.

Impact BIO-7: Impacts on the White-tailed Kite, Loggerhead Shrike, and Bryant's Savannah Sparrow – Less than Significant with Mitigation

The loggerhead shrike and Bryant's savannah sparrow (California species of special concern) and white-tailed kite (a state fully protected species) are known to roost and forage year-round in the northern portion of the Project Area (i.e., north of Caribbean Drive). In addition, Bryant's savannah sparrow may nest in marsh habitats adjacent to the Project Area, and the white-tailed kite and loggerhead shrike may nest in trees adjacent to grassland habitats within and adjacent to the Project Area. Thus, the loggerhead shrike, Bryant's savannah sparrow, and white-tailed kite were assessed together because the potential impacts of the Proposed Project on these species would be similar.

Heavy ground disturbance, noise, and vibrations caused by proposed floodwall construction, levee enlargement, maintenance road improvements, levee modifications, and bridge/culvert modification activities in the northern portion of the Project Area could potentially disturb foraging or roosting individual white-tailed kites, loggerhead shrikes, and Bryant's savannah sparrows and cause them to move away from work areas. Although the Project is not expected to directly impact nests, since these species would nest outside the Project Work Area, Project activities could result in the disturbance of nesting adults, possibly to the point of abandonment of active nests with eggs or nestlings, as described under *Determination of Impacts on Wildlife and Fisheries*, above.

Project activities would also result in the loss of foraging habitat for Bryant's savannah sparrows, white-tailed kites, and loggerhead shrikes. The grading of grassland areas north of Caribbean Drive, associated primarily with levee widening along the West Channel, would permanently remove 0.77 acre of foraging areas for these species (see **Figures 3.3-2a** through **3.3-3i** in **Appendix P**). However, the loss of 0.77 acre of foraging habitat is not expected to result in a substantial effect on populations of these species given the local and regional abundance of suitable foraging habitat, and the very small proportion (even on the scale of the northern portion of the Project Area) of suitable habitat that would be impacted.

Applicable Best Management Practices

The District would implement the following BMPs during construction activities. A description of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BIO-8: Avoid Impacts to Nesting Migratory Birds

BMP BIO-9: Use Exclusion Devices to Prevent Migratory Bird Nesting

BMP BIO-17: Minimize Predator-attraction Effects on Wildlife

Conclusion

Implementation of BMPs BIO-8 and BIO-9 would minimize disturbance of active nests of Bryant's savannah sparrows, white-tailed kites, and loggerhead shrikes. Implementation of BMP BIO-17 would minimize the attraction of nest predators to the Project Area. Pre-activity nesting bird surveys implemented with BMP BIO-8 would likely identify active nests of all bird species prior to the start of Project activities, and nests that are identified would not be disturbed. In addition, deterrence measures may be used to prevent birds from nesting in the Project Area. However, the Proposed Project could still result in the loss of active nests of the Bryant's savannah sparrow, white-tailed kite, and loggerhead shrike.

BMP BIO-8 does not specify how long before the start of Project activities the pre-activity survey for nesting birds must occur. If construction occurs during the nesting season and pre-activity nesting bird surveys are performed too far in advance of the onset of construction activities, active nests may be established in the period between the survey and the initiation of construction activities. Similarly, if there is an extended break in construction activities at a site, active nests may become established in the Project Work Area and subsequently be disturbed when Project activities resume.

Although BMP BIO-8 states that no birds, nests with eggs, or nests with hatchlings would be disturbed, it does not specify how disturbance would be prevented. Simple avoidance of the physical disturbance of an active nest is not sufficient to assure that Project activities would not result in loss of eggs or young as a result. As described under *Determination of Impacts to Wildlife and Fisheries* above, the initiation of new activities near an active nest may disturb the birds to the point of abandonment of the

eggs or chicks. However, BMP BIO-8 does not require the surveys to include areas adjacent to the Project Area; and therefore, nests in adjacent areas may be disturbed by Project construction activities.

The loss of active nests of Bryant's savannah sparrows, white-tailed kites, or loggerhead shrikes would be a potentially significant impact. The District would implement the following MMs to further avoid harm to these three species.

Mitigation Measure BIO-4: Pre-Construction Surveys for Nesting Birds

Pre-construction surveys for nesting birds shall be conducted by a qualified biologist to ensure that no nests will be disturbed during Project implementation. Surveys shall be conducted no more than one week prior to the initiation of construction activities in any given area; because construction may be phased, surveys will be conducted prior to the commencement of each phase of construction. The survey can be limited to the portions of the Project Work Area where construction activities will occur as well as a 250-foot buffer for raptors and a 50-foot buffer for non-raptors. The Project Work Area includes the channels themselves, the District's existing right-of-way/channel easements, and designated Project staging areas. During each survey, the ornithologist will inspect all trees and other potential nesting habitats (e.g., shrubs, ruderal grasslands, wetlands, and buildings) in and immediately adjacent to the impact areas for nests. If a lapse in Project-related work of one week or longer occurs, another focused survey will be conducted before Project work can be reinitiated.

Mitigation Measure BIO-5: Implement Buffer Zones for Nesting Birds

If an active nest is found sufficiently close to the Project Work Area (i.e., within 250 feet for raptors or 50 feet for non-raptors), a qualified biologist will determine the extent of a disturbance-free buffer zone to be established around the nest (typically 50 feet for non-raptors and 250 feet for raptors), to ensure that no nests of species protected by the MBTA and California Fish and Game Code will be disturbed during Project implementation. The buffer distance is measured as the straight-line distance between an active nest and the activity, taking both horizontal and vertical distance into account. No new² Project-related activities (i.e., activities that were not ongoing when the nest was established; for example, routine maintenance activities would not be considered "new") shall be performed within the buffer until the young have fledged or the nest has been determined to be inactive by a qualified ornithologist.

Reductions in the standard buffers (i.e., to buffers less than 50 feet for non-raptors and less than 250 feet for raptors) may be allowed where circumstances

² By establishing nests in areas with a certain level of existing activity, the birds will have demonstrated their tolerance of such activities. Thus, continuing the same level (or a reduced level) of activity should not cause the abandonment of the nest.

suggest the birds will not abandon the active nest with a reduced buffer size. A qualified biologist will determine whether reducing the buffer is likely to substantially increase disturbance of nesting birds, taking into account the presence or absence of dense vegetation, type of construction work, topography, or structures that would block Project activities from view; the life history and behavior of the bird species in question; and the nature of the proposed activity. If a reduced buffer is implemented, the biologist shall monitor bird behavior in relation to work activities. At a minimum, the biologist will monitor the baseline behavior of the birds for at least 30 minutes prior to the commencement of the activity (to determine the birds' behavior in the absence of the activity) and for at least one hour immediately following the initiation of the activity, when response by the nesting birds to the novel activity is expected to be greatest. If the birds exhibit abnormal nesting behavior which may cause reproductive failure (e.g., nest abandonment and loss of eggs and/or young), such as agitated/defensive flights and vocalizations directed towards Project personnel, birds standing up from a brooding position, birds flushing from the active nest, or cessation of provisioning of young with food, the disturbance-free buffer shall immediately be adjusted out to the standard buffer distance (250 feet for raptors and 50 feet for non-raptors) until the birds have resumed their normal behavior (e.g., incubation or feeding of young). After 2 hours with all work confined to the area outside the standard buffer, work would again be attempted in the area within the reduced buffer, and the process would be repeated to determine if the birds have habituated to the activity. If the process is repeated three times without the birds indicating that they are habituating to the activity, then the standard buffer will be maintained until the next day, when the process above would again be attempted. If the birds do not indicate that they are habituated to Project activities during the initial 2 days of attempting work within a reduced buffer, the standard buffer shall be implemented. Project activities within the reduced buffers shall not resume until the District has consulted with CDFW and both the qualified biologist and CDFW confirm that the birds' behavior has normalized, or until the nest is no longer active.

With the implementation of MMs BIO-4 and -5 it is anticipated that disturbance of the nests of these three bird species would be minimized, and this impact would be reduced to a less-than-significant level.

Impact BIO-8: Impacts on Burrowing Owls – Less than Significant with Mitigation

The burrowing owl, a California species of special concern, has been regularly documented roosting and foraging in grassland habitats in the northern portion of the Project Area (i.e., on the old landfills surrounding the City of Sunnyvale Recycle Center and WPCP) over the past decade, and small numbers likely nest in these areas (EDAW 2008; CNDDDB 2013; eBird 2013; Santa Clara County bird data, unpublished; South Bay

Birds List-serve 2013). Suitable habitat for this species (i.e., ruderal areas with burrows of California ground squirrels) is present along the Sunnyvale Channels north of Caribbean Drive and within Staging Area sites 13, 14, and 15, and burrowing owls could potentially nest, roost, or forage in these locations. Burrowing owls are unlikely to use the narrow channels lined with urban landscapes, south of Caribbean Drive, but occasional non-breeding individuals could occur in these areas.

Impacts from the Proposed Project may affect burrowing owl habitat (nesting, foraging, and roosting) and/or individuals. Because they nest underground, individual burrowing owls (especially young or adults in burrows) may be killed or injured during Project activities from trampling by construction personnel or equipment. Project activities that occur in close proximity to active burrows may disturb owls to the point of abandoning their burrows, including active nests, eggs, and young. In addition, clearing and grading for levee enlargement, maintenance road improvements, floodwall construction, and staging areas could result in the direct loss of habitat or individuals through the disturbance of grassland areas that support ground squirrel burrows.

Burrowing owls seem to occur more widely in the South San Francisco Bay in winter than they do during the nesting season. For example, burrowing owls occur on Coyote Ridge and in Coyote Valley during winter, but they have not been recorded lingering into spring and summer to nest in those areas in recent years. This suggests that wintering habitat for burrowing owls is not limiting the species' South San Francisco Bay populations. As a result, impacts of Proposed Project activities on wintering owl habitat, including burrows that were occupied by owls only during the winter but that were not used for nesting, are not expected to affect appreciably regional populations of this species. However, as the availability of grassland habitat used for nesting in the Project region continues to dwindle because of development, the South San Francisco Bay nesting population of burrowing owls faces extirpation caused by lack of sufficient suitable nesting and nesting-season foraging habitat and isolation from other populations and habitat areas. Therefore, impacts on individual burrowing owls (at any time of year) and occupied nesting habitats resulting from the Proposed Project would contribute to the broader-scale decline in regional burrowing owl populations.

Albion Environmental (2009) assessed the potential impact of the District's proposed burrow management under the SMP on burrowing owls. Because no evidence existed that District levees provided important burrowing owl nesting or roosting habitat (i.e., used regularly or by a sizeable proportion of the South San Francisco Bay population), Albion Environmental concluded that management of burrows on the District's levees would not result in a substantial impact on burrowing owl habitat. Thus, although ostensibly suitable habitat for burrowing owls occurs along levees in the Project Area, Project-related impacts on burrowing owls along levees is expected to be relatively low.

However, burrowing owls have been documented roosting, nesting, and foraging in grassland habitats on the old landfills surrounding the City of Sunnyvale Recycle Center and WPCP, which lie immediately adjacent to the Sunnyvale Channels. This occupied

habitat is contiguous with suitable nesting, roosting, and foraging habitat that is present within the area that would be covered with fill and by the levee enlargement along the West Channel between Caribbean Drive and Carl Road. As a result, habitat within the Project Area north of Caribbean Drive is likely used to some extent as foraging habitat by burrowing owls that breed in the vicinity. North of Caribbean Drive, 0.77 acre of ruderal/non-native grassland would be permanently lost due to Project activities, including the proposed levee widening, and an additional 10.27 acres would be temporarily disturbed. Although nesting within these impact areas is unlikely due to their proximity to maintenance roads regularly used by pedestrians (including dog-walkers), it is possible that owls may nest or roost in these areas as well. Further, suitable grassland habitat with burrows of California ground squirrels is also present in Staging Area sites 13, 14, and 15, and although the species has not been documented at either site, burrowing owls could nest, roost, and/or forage in these locations. Project staging activities could result in the temporary disturbance of up to 5.23 acres of suitable burrowing owl habitat within Staging Area sites 13, 14, and 15.

Applicable Best Management Practices

The District would implement the following BMPs to reduce harm to individual burrowing owls. A description of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BIO-8: Avoid Impacts to Nesting Migratory Birds

BMP BIO-17: Minimize Predator-attraction Effects on Wildlife

Conclusion

The implementation of the BMPs listed above would reduce potential harm to burrowing owls as a result of Project activities. Nesting bird surveys would likely identify active nests of burrowing owls prior to the start of Project activities, and nests that are identified would not be disturbed. As required by BMP BIO-17, removing trash from work areas would reduce potential impacts on burrowing owls due to the attraction of predators to the area. However, the Proposed Project could still result in the loss of active nests of the burrowing owl, as BMPs such as BIO-8 do not include sufficient specificity to ensure that burrowing owl nests would be detected. In addition, the loss of any occupied burrowing owl nesting habitat as a result of the Project would contribute to the cumulative loss of habitat for this species in the South San Francisco Bay. The loss of active burrows, as well as the associated surrounding habitat, for breeding burrowing owls would be potentially significant. The District would implement the following MM to reduce potential harm to burrowing owls during construction and to address loss of burrowing owl habitat.

Mitigation Measure BIO-6: Conduct Pre-Construction Surveys for Burrowing Owls

Pre-construction surveys for burrowing owls shall be conducted prior to the initiation of all Project activities within suitable burrowing owl habitat (i.e., ruderal/grassland habitat with burrows of California ground squirrels). Pre-construction surveys will be completed in conformance with the CDFW's 2012 guidelines (CDFG 2012). An initial habitat assessment will be conducted by a qualified biologist to determine if suitable burrowing owl habitat is present in a given area. During the initial site visit, a qualified biologist will survey the entire activity area and (to the extent that access allows) the area within 250 feet of the site for suitable burrows that could be used by burrowing owls for nesting or roosting. If no suitable burrowing owl habitat (i.e., ruderal grasslands with burrows of California ground squirrels) is present within a given area, no additional surveys will be required. If suitable burrows are determined to be present within 250 feet of work areas, a qualified biologist will conduct three additional surveys to investigate each burrow within the survey area for signs of owl use and to determine whether owls are present in areas where they could be affected by proposed activities. The final survey shall be conducted within the 24-hour period prior to the initiation of Project activities in any given area. Because Project activities may be phased, these survey efforts may also need to be performed in phases to ensure that burrowing owls are not present in work areas when Project activities commence. This measure applies to the staging areas as well as the Project areas along the Sunnyvale Channels.

Mitigation Measure BIO-7: Implement Buffer Zones for Burrowing Owls

If burrowing owls are present during the non-breeding season (generally September 1 to January 31), a 150-foot buffer zone shall be maintained around the occupied burrow(s), if feasible. If maintaining such a buffer is not feasible, then the buffer must be great enough to avoid injury or mortality of individual owls, or else the owls should be passively relocated as described in MM BIO-9 below. During the breeding season (generally February 1 to August 31), a 250-foot buffer, within which no new Project-related activities will be permissible, will be maintained between Project activities and occupied burrows. Owls present between February 1 and August 31 will be assumed to be nesting, and the 250-foot protected area will remain in effect until August 31. If monitoring evidence indicates that the owls are no longer nesting or the young owls are foraging independently, the buffer may be reduced or the owls may be relocated prior to August 31, in consultation with the CDFW.

Mitigation Measure BIO-8: Monitor Owls during Construction

Any owls occupying the Project Area are likely habituated to frequent human disturbances throughout the year in the form of District maintenance activities and recreational use of the levee maintenance roads. As a result, they may

exhibit a tolerance of greater levels of human disturbance than owls in more natural settings, and work within the standard 250-foot buffer during the nesting season may be able to proceed without disturbing the owls. Therefore, if nesting owls are determined to be present on the site, and Project activities cannot feasibly avoid disturbance of the area within 250 feet of the occupied burrow during the nesting season (i.e., February 1 through August 31) due to other seasonal constraints, a qualified biologist will be present during all activities within 250 of the nest to monitor the owls' behavior. If in the opinion of the qualified biologist, the owls are unduly disturbed (i.e., disturbed to the point of harm or reduced reproductive success), all work within 250 feet of the occupied burrow will cease, and MM 7 shall be implemented.

Mitigation Measure BIO-9: Passively Relocate Burrowing Owls

If construction will directly impact occupied burrows, a qualified biologist will passively evict owls from burrows during the nonbreeding season (September 1 to January 31). No burrowing owls will be evicted during the nesting season (February 1 through August 31) except with the CDFW's concurrence that evidence demonstrates that nesting is not actively occurring (e.g., because the owls have not yet begun nesting early in the season, or because young have already fledged late in the season). Eviction will occur through the use of one-way doors inserted into the occupied burrow and all burrows within impact areas that are within 250 feet of the occupied burrow (to prevent occupation of other burrows that will be impacted). One-way doors will be installed by a qualified biologist and left in place for at least 48 hours before they are removed. The burrows will then be back-filled to prevent re-occupation.

Although relocation of owls may be necessary to avoid the direct injury or mortality of owls during construction, relocated owls may suffer predation, competition with other owls, or reduced health or reproductive success as a result of being relegated to more marginal habitat. However, the benefits of such relocation, in terms of avoiding direct injury or mortality, would outweigh any adverse effects.

Mitigation Measure BIO-10: Restoration of Temporary Impact Areas

Upland ruderal/grassland habitat in Project Work Areas on both Sunnyvale Channels north of Caribbean Drive and in the staging areas that are temporarily impacted will be restored following the completion of construction. The District shall seed these areas with a native grassland/forb seed mix to allow for the resumption of conditions suitable for use by California ground squirrels and burrowing owls.

Mitigation Measure BIO-11: Compensatory Mitigation for Burrowing Owls

If direct impacts of occupied breeding habitat cannot be avoided (see MM BIO-8), compensatory mitigation will be provided in the form of habitat preservation

and/or management. All ruderal/non-native grasslands located within the portion of the Project Work Area located north of Caribbean Drive are considered occupied breeding habitat, because (1) burrowing owls have been widely documented to occupy the grassland habitats on the old landfills surrounding the City of Sunnyvale Recycling Center and WPCP, (2) known occupied habitat in these areas is contiguous with potentially suitable burrowing owl habitat within the Project Area, and (3) burrows and associated surrounding habitat are essential ecological requisites for burrowing owls throughout the year (CDFG 2012). Habitat compensation shall be provided for all Project impacts that result in a permanent loss of ruderal/non-native grasslands north of Caribbean Drive at a ratio of 2:1, on an acreage basis.

Additional habitat compensation will be provided in the event that any burrowing owls require relocation from suitable nesting habitat (i.e., north of Caribbean Drive or in Staging Area sites 13, 14, or 15). Mitigation will consist of preservation and/or management of owl habitat at a ratio of 9.75 – 19.5 acres of suitable habitat for every pair (or single owl, if unpaired) that must be relocated from these areas, in accordance with California Burrowing Owl Consortium (1993) guidelines. The amount of mitigation habitat provided will depend on whether the mitigation habitat is occupied by burrowing owls (9.75 acres), adjacent to occupied habitat (13.0 acres), or suitable but unoccupied (19.5 acres). Compensatory mitigation is not required in the unlikely event that owls require relocation from portions of the channels south of Caribbean Drive, as these areas do not provide suitable breeding habitat.

Mitigation may be provided via the management of suitable habitat on District lands (either existing lands or lands that are acquired), purchase of credits in a mitigation bank (if one is available), or contribution of funds toward the management of the required amount of suitable habitat owned by another entity (e.g., partnering with the City of Sunnyvale to manage habitat on the old landfills north of Caribbean Drive). The mitigation site must be located in Santa Clara County, or in areas of San Mateo or Alameda counties adjacent to San Francisco Bay, so that the mitigation supports the maintenance of the South San Francisco Bay burrowing owl populations.

If the District provides habitat mitigation either on existing District lands or on lands that are acquired for mitigation purposes, a habitat mitigation and monitoring plan (HMMP) will be prepared detailing the following:

1. the areas to be preserved for owls;
2. the methods for managing on-site habitat for owls and their prey (including vegetation management to maintain low-statured herbaceous vegetation);

3. methods for enhancing burrow availability within the mitigation site (potentially including the provision of artificial burrows, although long-term management for ground squirrels will be important as well); and
4. measures to minimize adverse effects of development on owls on the site; and a monitoring program and adaptive management program; and
5. performance indicators and success criteria, including the maintenance of ground squirrel burrows at a density similar to densities on the old landfills that currently support burrowing owls, and the maintenance of low-statured herbaceous vegetation.

Implementation of MMs BIO-6 through -11 would ensure that active burrowing owl nests are not disturbed, that individuals are safely relocated before their burrows are impacted, and that permanent loss of occupied burrowing owl breeding habitat is adequately compensated.

The mitigation ratio for permanent loss of foraging habitat used by breeding owls reflects the rarity of the species in the South San Francisco Bay area, its declining population trends, and the importance of maintaining foraging habitat for burrowing owls in areas that the species still occupies (all of which justify a ratio greater than 1:1). However, a ratio higher than 2:1 would be unnecessary given that the occupied habitat to be impacted represents a very small proportion of foraging habitat on and adjacent to the former landfills, and given that nesting by burrowing owls is unlikely to occur in the immediate Project footprint owing to disturbance by recreational use of District maintenance roads.

Compensatory mitigation is necessary if owls are evicted from potential nesting habitat because even if impacts to the area in question are temporary (as they would be in the staging areas), eviction of owls from these areas may result in a reduction in reproductive effort while construction is ongoing, as the evicted owls would be forced to disperse to other areas to breed, and suitable breeding habitat in the region may be sufficiently limited that these owls may be relegated to marginal-quality habitat. In addition, relocated owls may not return to the habitat they formerly occupied, and given the scarcity of suitable burrowing owl habitat and small size of owl populations in the South San Francisco Bay area, the loss of an owl territory in such a manner would result in a substantial impact on the species' regional populations.

Recent guidance on burrowing owl mitigation from the CDFW (CDFG 2012) and the conservation program of the Santa Clara Valley Habitat Plan (ICF 2012) was considered in determining the compensatory mitigation appropriate for this Project's impacts on burrowing owls. However, because the Project is outside the Valley Habitat Plan area and is not covered by the Valley Habitat Plan, because the Project's permanent impacts to areas that could be used as foraging habitat by breeding owls are limited, and because the impact resulting from eviction of owls from potential nesting habitat could be disproportionate to the limited extent of permanent habitat impacts, the Project does not

easily lend itself to providing mitigation according to those examples. The compensatory mitigation described above was devised after careful consideration of the mitigation options.

With implementation of MMs BIO-6 through -11, this impact would be reduced to a less-than-significant level.

Impact BIO-9: Impacts on the Alameda Song Sparrow and San Francisco Common Yellowthroat – Less than Significant with Mitigation

The Alameda song sparrow and San Francisco common yellowthroat (California species of special concern) occur year-round in the northern portion of the Project Area (i.e., north of Caribbean Drive). These species are similarly associated with marsh habitats, and both are known to nest in the Project Area. These species are assessed together because the potential impacts of the Proposed Project on these species would be similar.

Similar to the impacts described for other special-status bird species under *Impact BIO-7: Impacts on the White-tailed Kite, Loggerhead Shrike, and Bryant's Savannah Sparrow* above, ground disturbance, noise, and vibrations caused by proposed floodwall construction, levee enlargement, levee raising, and bridge/culvert modification activities in the northern portion of the Project Area could potentially disturb foraging or roosting individual Alameda song sparrows and San Francisco common yellowthroats and cause them to move away from work areas. In addition, Proposed Project activities along levees could result in the disturbance or destruction of active nests with eggs or nestlings. Such impacts may occur as a result of vegetation removal or the disturbance of individuals nesting immediately adjacent to construction areas, as described under *Determination of Impacts on Wildlife and Fisheries*, above. Based on the extent of suitable habitat within the Project Area and typical territory sizes of these species, an estimated three to six pairs of each species could potentially nest within or immediately adjacent to the Project Area where relatively dense marsh habitat occurs in the channels north of Caribbean Drive, and nests of these individuals may be affected by Project activities.

Project activities would also result in the loss of foraging habitat for Alameda song sparrows and San Francisco common yellowthroats. The grading of grassland areas north of Caribbean Drive along the West Channel would permanently remove 0.77 acre of foraging habitat for these species. However, the loss of 0.77 acre of foraging habitat is not expected to result in a substantial effect on these species' populations given the abundance of suitable foraging habitat in the region. The construction of floodwalls is not expected to increase shading within marsh areas enough to substantially affect instream marsh habitat, but 0.003 acre of tidal brackish marsh habitat would be permanently lost in the northern portion of the Project Area as a result of activities associated primarily with the widening of the levee between Carl Road and Caribbean

Drive (see **Figures 3.3-2a** through **3.3-3i** in **Appendix P**). However, as described under *Impact BIO-2: Impacts on Green Sturgeon, Steelhead, and Longfin Smelt*, this habitat is expected to rapidly re-establish following the completion of construction activities.

In addition, ground-disturbing activities such as grading and excavation may result in erosion and sedimentation, which would potentially degrade or reduce suitable marsh habitat for these species downslope and downstream of work areas.

Applicable Best Management Practices

The District would implement the following BMPs when performing any type of Project activity that necessitates work within or adjacent to the active channel. A description of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BIO-8: Avoid Impacts to Nesting Migratory Birds

BMP BIO-9: Use Exclusion Devices to Prevent Migratory Bird Nesting

BMP BIO-17: Minimize Predator-attraction Effects on Wildlife

Conclusion

Implementation of BMPs BIO-8 and BIO-9 would reduce impacts on nests of Alameda song sparrows and San Francisco common yellowthroats as a result of Project-related disturbances. In addition, implementation of BMP BIO-17 would minimize potential harm to these species from the attraction of nest predators to the Project Area. However, as described under *Impact BIO-7: Impacts on the White-tailed Kite, Loggerhead Shrike, and Bryant's Savannah Sparrow* above, the Proposed Project could still result in the loss of active nests of the Alameda song sparrow and San Francisco common yellowthroat. The loss of active nests of Alameda song sparrows and San Francisco common yellowthroats would be potentially significant. The District would implement the following MMs to further reduce potential harm to these species from Project construction.

Mitigation Measure BIO-4: Pre-Construction Surveys for Nesting Birds

Refer to Impact BIO-7 above for further details of this measure.

Mitigation Measure BIO-5: Implement Buffer Zones for Nesting Birds

Refer to Impact BIO-7 above for further details of this measure.

Implementation of Mitigation Measures BIO-5 and -6 would avoid impacts to active nests of these species, and reduce this impact to a less-than-significant level.

Impact BIO-10: Impacts on Non-Special-Status Birds – Less than Significant with Mitigation

The marsh, grassland, and open water habitats of the Project Area support a relatively high abundance and diversity of common (non-special-status) birds due to the extensive

length of the Sunnyvale Channels, and due to the high density and diversity of birds that nest in marsh habitats and around the WPCP in areas of the Project Area north of Caribbean Drive. The developed/landscaped habitats also support common nesting birds. In total, more than 40 species of native common bird species are expected to nest at the Project Area and in immediately adjacent areas (Bousman 2007a, Santa Clara County bird data, unpublished). Examples of such species include the Canada goose, gadwall (*Anas strepera*), mallard, cinnamon teal (*Anas cyanoptera*), northern pintail (*Anas acuta*), lesser scaup (*Aythya affinis*), ruddy duck (*Oxyura jamaicensis*), pied-billed grebe, Cooper's hawk, red-tailed hawk, American kestrel (*Falco sparverius*), common gallinule (*Gallinula galeata*), American coot, killdeer (*Charadrius vociferus*), mourning dove, white-throated swift (*Aeronautes saxatalis*), Anna's hummingbird, belted kingfisher, downy woodpecker (*Picoides pubescens*), black phoebe, western scrub-jay (*Aphelocoma californica*), American crow, common raven, northern rough-winged swallow (*Stelgidopteryx serripennis*), cliff swallow, barn swallow (*Hirundo rustica*), chestnut-backed chickadee (*Poecile rufescens*), bushtit, Bewick's wren (*Thryomanes bewickii*), marsh wren, American robin, northern mockingbird (*Mimus polyglottos*), California towhee, song sparrow, dark-eyed junco, red-winged blackbird, western meadowlark, Brewer's blackbird, hooded oriole (*Icterus cucullatus*), Bullock's oriole (*Icterus bullockii*), house finch, and lesser goldfinch (*Spinus psaltria*).

Implementation of the Proposed Project has the potential to result in the injury or mortality of common birds, especially eggs or young in nests. Such impacts may occur as a result of vegetation removal or the disturbance of individuals nesting within or immediately adjacent to the Project Work Areas, as described under *Determination of Impacts on Wildlife and Fisheries* above.

Implementation of the Proposed Project would result in a small loss of nesting and foraging habitat for common native birds. However, while the Project Area supports a high diversity of native birds within a relatively small area, the habitats at the Project Area represent a very small proportion of the habitats that support these species regionally. In addition, many birds are expected to continue to nest and forage at the Project Area once Project construction is completed as they are habituated to disturbance as a result of the frequent use of the levee roads by recreationists. Although fewer pairs of birds are expected to nest and forage at the Project Area following Project construction due to the small loss of nesting and foraging habitat, the decline in bird abundance resulting from habitat loss is expected to be very low with retention of many trees and planting of earthen channels.

Applicable Best Management Practices

The District would implement the following BMPs when performing any type of Project activity that necessitates work within or adjacent to the active channel. A description of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BIO-8: Avoid Impacts to Nesting Migratory Birds

BMP BIO-9: Use Exclusion Devices to Prevent Migratory Bird Nesting**BMP BIO-17: Minimize Predator-attraction Effects on Wildlife****Conclusion**

Implementation of BMPs BIO-8 and BIO-9 would reduce impacts on nests of non-special status bird species as a result of Project-related disturbances. In addition, implementation of BMP BIO-17 would minimize potential harm to these species from the attraction of nest predators to the Project Area. Implementation of Project BMPs would reduce potential harm to common birds as a result of Project activities. However, as described under *Impact BIO-7: Impacts on the White-tailed Kite, Loggerhead Shrike, and Bryant's Savannah Sparrow* above, the Proposed Project could still result in the loss of active nests of migratory birds. It is likely that one to several pairs of more than 40 common, native bird species are expected to nest within the Project Work Area or in immediately adjacent areas. This expectation is based on site observations, the extent of the Project Area, and the density of birds expected to nest within or adjacent to the Project Area (Bousman 2007a, Santa Clara County bird data, unpublished). All of these species are abundant to fairly common in the region (Bousman 2007a), and the loss of a few nests of any of these species would affect only a very small proportion of the regional populations of any one species. However, given the relatively high diversity and density of nesting birds in and adjacent to the Project Work Area as a whole, coupled with the long, linear nature of the Project Area, construction activities that occur during the nesting season could result in the loss of reproductive effort for a relatively large number of nests comprising a fairly diverse bird community. At least locally (i.e., in the immediate vicinity of the Project Area), such an impact would have a substantial effect on the bird community. The loss of avian reproductive effort resulting from construction during the nesting season would be a potentially significant impact. The District would implement the following MMs to further reduce potential harm to these bird species.

Mitigation Measure BIO-4: Pre-Construction Surveys for Nesting Birds

Refer to Impact BIO-7 above for further details of this measure.

Mitigation Measure BIO-5: Implement Buffer Zones for Nesting Birds

Refer to Impact BIO-7 above for further details of this measure.

Implementation of Mitigation Measures BIO-4 and -5 would avoid impacts to these species, and reduce this impact to a less-than-significant level.

Impact BIO-11: Impacts on Salt Marsh Harvest Mouse and Salt Marsh Wandering Shrew – Less than Significant with Mitigation

The salt marsh harvest mouse (a federally and state endangered species and a state fully protected species) and the salt marsh wandering shrew (a California species of special concern) are similarly associated with tidal marsh habitats adjacent to the Project

Area. Because potential impacts of the Project on these species would be similar, they were assessed together. Habitat for both salt marsh harvest mice and salt marsh wandering shrews consists of pickleweed-dominated areas of tidal marshes and diked and muted tidal marshes.

No suitable breeding or foraging habitat for the salt marsh harvest mouse or salt marsh wandering shrew occurs at the Project Area. However, suitable habitat for both species occurs immediately adjacent to the Project Area along the southern edge of Pond A4, within the Guadalupe Slough, and in a mitigation area located east of the Twin Creeks Sports Complex and south of the existing East Channel levee/maintenance road. In addition, upland transitional habitat along the levees immediately adjacent to the Project Area in these areas may provide cover for salt marsh harvest mice and salt marsh wandering shrews during high winter tides. Thus, although no suitable breeding or foraging habitat is present within the Project Area, the species may be present in tidal and non-tidal brackish marsh immediately adjacent to the Project Area.

As described under *Determination of Impacts on Wildlife and Fisheries* above, levee raising activities along the northeastern-most portion of the East Channel at its confluence with Guadalupe Slough may result in the injury or mortality of salt marsh harvest mice and salt marsh wandering shrews from crushing or injury by personnel or equipment. In addition, the disturbance of upland transitional habitat surrounding marshes could potentially disturb salt marsh harvest mice or wandering shrews seeking refuge during high tides.

Noise and vibrations due to Project-related disturbances on levees are unlikely to cause individuals of these species inhabiting nearby transitional habitats to flush into open areas where predation may occur. Such individuals would be acclimated to existing levels of disturbance on these levees, including regular District maintenance activities, and are unlikely to leave areas with vegetative cover due to noise and vibrations.

Applicable Best Management Practices

The District would implement the following BMPs when performing any type of Project activity. A description of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BIO-16: Avoid Animal Entry and Entrapment

BMP BIO-17: Minimize Predator-attraction Effects on Wildlife

BMP WQ-42: Prevent Sedimentation of Aquatic Habitats During Construction

Conclusion

BMPs BIO-16 and BIO-17 would reduce potential harm to the salt marsh harvest mouse and wandering shrew within the Project Area, should these species occur there. However, due to the extremely low frequency with which salt marsh harvest mice and wandering shrews could possibly occur at the Project Area, Project activities are highly

unlikely to affect individuals of these species. In addition, should an individual happen to occur in adjacent transitional habitats, Project activities are not expected to disturb individuals to the point of flushing into open areas. Nevertheless, installation of the silt fence associated with BMP WQ-42 along the south bank of the East Channel near its confluence with Guadalupe Slough could potentially result in disturbance of individual salt marsh harvest mice, salt marsh wandering shrews, and their habitat, a potentially significant impact, due to the proximity of suitable habitat immediately adjacent to the Project Area. The District would implement the following MM to further reduce potential harm to these species.

Mitigation Measure BIO-12: Maintain Buffer during Construction Adjacent to Salt Marsh Harvest Mouse and Salt Marsh Wandering Shrew Habitat

During levee raising activities along the south/east bank of the East Channel near its confluence with Guadalupe Slough, starting at the eastern edge of the Twin Creeks Sports Complex and continuing eastward, a minimum 10-foot buffer, measured as the straight-line distance (e.g., diagonally/down-slope on a sloped bank) will be maintained between the outer limits of Project construction activities (i.e., silt fence installation) and any marsh habitat present beyond the Project boundary (i.e., in the wetland mitigation area to the south or along Guadalupe Slough to the north). In addition, Project personnel would ensure that the silt fencing in this area is sturdy and is regularly maintained so that no material falls into these wetlands during levee raising.

Implementation of MM BIO-12 would ensure that no Project activities occur close enough to potentially occupied habitat to adversely affect these species, and would reduce this impact to a less-than-significant level.

Impact BIO-12: Impacts on Bats – Less than Significant with Mitigation

Only two special-status bats have any potential to occur at the Project Area: the pallid bat and western red bat, both of which are California species of special concern. Pallid bats are not expected to roost in the Project Area, as this species has been extirpated from urban areas so close to the Bay, as in the case of the Project Area. Pallid bats may occasionally occur at the Project Area as nonbreeding migrants, transients, or foragers, but they are expected to occur in low numbers, if at all. Western red bats do not breed in the Project Area, so no maternity roosts would be impacted. This species roosts solitarily in foliage. Due to the very limited Project impacts to trees, it is unlikely that any red bat roosting sites would be impacted, and in the event that such an impact does occur, any roosting red bat would be able to flee before the tree is removed. Although such flushed individuals may be subjected to increased risk of predation if flushed during the daytime, few, if any, western red bats are expected to be present in areas where they would be disturbed by Project activities.

Other, non-special-status bat species are expected to occur more regularly, and in higher numbers, in the Project Area. Yuma bats and Mexican free-tailed bats may roost in culverts or bridges at the Project Area. For example, on the SR 237 bridge over the East Channel, crevices were found to support evidence of roosting bats (droppings and urine staining), and it is possible that large numbers of individuals may use this bridge as a day roost (including a maternity and non-maternity roost). In addition, other bridges and culverts may support lower numbers of individuals.

As described under *Existing Conditions* above, box culverts at North Mathilda Avenue, Ross Drive, Ahwanee Avenue, East Duane Avenue, and East El Camino Real could potentially contain recesses (e.g., access holes with manhole covers) that provide day and night-roosting habitat, as well as breeding habitat, for colonies of bats (e.g., up to 30 individuals). However, no extensive modifications (e.g., demolition and replacement, raising of headwalls, or extension of a box culvert) are proposed at any of these locations. Therefore, Project activities near these culverts would not result in substantial impacts on roosting bats.

Only one location potentially supporting a large colony of bats would be subject to potentially intensive disturbance; the Project would raise the headwalls upstream and downstream of the SR 237 crossing of the East Channel, which could potentially support a large colony (i.e., 100 to 1,000 individuals) of Mexican free-tailed bats or Yuma bats. This activity (and all other Project-related activities associated with culverts and bridges) would not result in the loss of any roosting sites, such as crevices or weep holes. However, disturbance associated with construction activities at this location could result in bats flushing from their roost under the bridge during the day. These bats could potentially suffer increased predation rates, and construction during the maternity season (April 1 to July 31) could result in abandonment of young by their mothers, resulting in mortality of the young. The loss of a small colony of non-special-status bats (i.e., fewer than 10 bats) would not result in a substantial effect on regional populations because of the regional abundance of non-special-status bat species. However, due to the number of individuals that could be roosting on the SR 237 bridge over the East Channel, a substantial number of bats could potentially be displaced during Project construction, potentially resulting in abandonment of large numbers of young.

The Proposed Project would impact foraging habitats and/or individuals of these species as described under *Determinations of Impacts on Wildlife and Fisheries* above. Project activities may result in a temporary impact on foraging individuals through the alteration of foraging patterns (e.g., avoidance of work sites because of increased noise and activity levels during Project activities). However, due to the abundance of suitable foraging habitat in the Project vicinity and the mobility of these bats, as well as the relatively low proportion of potential foraging habitat that would be lost as a result of the Project, habitat impacts on bats would not be substantial.

Applicable Best Management Practices

The District would implement the following BMP during Project construction activities. A description of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP BIO-17: Minimize Predator-attraction Effects on Wildlife

Conclusion

Implementation of BMP BIO-17 would minimize the attraction of bats to areas of the Project Area where Project construction is occurring. Although no roosting habitat for colonial bats (i.e., existing crevices or weep holes in bridges and culverts) would be altered by the Project, and thus the Project would have no long-term impact on bat habitat or populations in the region, there is some potential for modification of the headwalls at the SR 237 bridge over the East Channel to result in abandonment of a large colony of non-special-status bats. It is possible that many of these bats would tolerate the construction activity, since it would occur during the day, and that the bats therefore would not abandon the colony. Moreover, these bats are expected to return to the bridge following the completion of construction, and it is possible that many or most of these bats could find alternative roost sites during the construction period if they do leave the bridge temporarily. However, if abandonment were to occur during the maternity season, large numbers of young could be abandoned. Due to the loss of reproductive effort this would entail, such an impact could have a potentially substantial impact on regional populations.

Mitigation Measure BIO-13: Avoid Construction during Bat Maternity Season

During the maternity season (April 1 through July 31), a 100-foot buffer, within which no new, construction-related activities shall occur, will be maintained around the SR 237 bridge over the East Channel. Modification of the headwalls at, and any other work within 100 feet of, this bridge shall occur outside the maternity season (i.e., this work will occur between August 1 and March 31) so no non-flying young will be present and any bats using the bridge will be able to disperse if they cannot tolerate this disturbance.

Implementation of MM BIO-13 would prevent bats from abandoning an active maternity colony, and would reduce this impact to a less-than-significant level.

Other Biological Resources Impacts

Impact BIO-13: Impacts on Other Non-Special-Status Species – Less than Significant

Impacts on undeveloped habitats at the Project Area (refer to **Figures 3.3-2a through 3.3-3i in Appendix P**) would result in impacts on common (non-special-status) invertebrate, reptilian, and mammalian species that occur there. These species were

assessed together because Project-related impacts on these species would be similar. Impacts of the Project on common species of fish and amphibians, birds, and bats are addressed separately under Impacts BIO-4, BIO-11, and BIO-13.

Common invertebrate, reptilian, and mammalian species would experience the permanent loss of 4.89 acres of upland habitats (i.e., undeveloped lands) due to the Project. The Project could also potentially result in the mortality, injury, disturbance, and displacement of individuals of some of these species as described under *Determination of Impacts on Wildlife and Fisheries* above. The operation of heavy equipment, excavation or placement of fill, or trampling by personnel could potentially result in the disturbance, injury, or mortality of individuals of these species.

Small mammals that occur at the Project Area (e.g., California ground squirrels, Botta's pocket gophers) provide a prey base for terrestrial predators and raptors that forage for small rodents. The development of 4.89 acres of upland habitats would reduce local occurrences of small mammal species and potentially result in impacts on predatory species that forage at the Project Area. Project impacts on wildlife movement are discussed in Impact BIO-17 below.

Applicable Best Management Practices

No District BMPs are applicable to this impact.

Conclusion

The common insect, reptilian, and mammalian species that occur at the Project Area are regionally abundant, and can be found in habitats throughout the City of Sunnyvale (e.g., in yards, parks, streams, riparian areas, and grasslands) and/or along the South San Francisco Bay (e.g., in grassland areas on old landfills around the WPCP and in marshes along the edges of the South San Francisco Bay). Further, because many of these species are urban-adapted, they would continue to be present at the Project Area following Project construction. Because these species are regionally abundant, are present in widely available habitats in the region, and may continue to be present at the Project Area following construction, the Project would impact only a small proportion of their regional populations. Such loss of regionally abundant common wildlife species does not achieve the threshold of a substantial reduction in the regional habitat of these species, and thus these impacts are considered less-than-significant.

Populations of small mammals are abundant in the region, and reductions in the numbers of California ground squirrels and other small mammals at the Project Area would not impact a substantial proportion of prey available to predators of these species regionally. While reductions in prey availability at the Project Area could affect the breeding and foraging territories of individuals of several predatory species, this impact is not expected to affect populations of these species in the region. Therefore, this impact is considered less than significant.

Impact BIO-14: Impacts on Wildlife Movement Corridors – Less than Significant

For many species, the landscape is a mosaic of suitable and unsuitable habitat types. Environmental corridors, such as stream courses, are segments of suitable habitat that provide connectivity between larger areas of suitable habitat, allowing species to disperse through otherwise unsuitable areas. On a broader level, corridors also function as avenues along which wide-ranging animals can travel, plants can propagate, genetic interchange can occur, populations can move in response to environmental changes and natural disasters, and threatened species can be replenished from other areas.

The Sunnyvale Channels are expected to function as wildlife movement corridors, connecting primarily urban associated habitats in the southern portion of the Project Area with San Francisco Bay associated habitats to the north. To fully analyze the potential impacts of the Proposed Project on wildlife movement, it is important to examine the potential impacts on both movement along the corridors (i.e., parallel to the channels) as well as impacts on wildlife movement across the channels.

The quality of habitat provided in channel easements and wetland habitats along the Sunnyvale Channels is generally relatively low. Habitats within the existing corridors have typically been subjected to moderate to high levels of disturbance as a result of the hardening of streambanks, installation of culverts, and other factors associated with the urban surroundings. As a result, many areas have little vegetation at all, and where vegetation is present, it is mostly dominated by non-native species.

Upstream/south of their crossings with Caribbean Drive, habitat within the Sunnyvale Channels can be described as urban and ruderal. The channels are typically narrow, channel easements are typically confined on both sides by dense urban development, and channel and easement vegetation is often sparse or non-existent. Both Sunnyvale Channels are routed through several culverts, a few of which extend up to several hundred feet. Thus, in the areas upstream/south of Caribbean Drive, the Sunnyvale Channels likely do not function as high-quality movement corridors for most species, particularly special-status species. Nevertheless, these ruderal habitats may represent the most feasible means of dispersal through the surrounding urban matrix for common urban dwelling species at the Project Area, such as raccoons and California ground squirrels.

Proposed Project activities upstream/south of Caribbean Drive include rock slope protection. This activity could have adverse effects on wildlife movement along the channels as a result of impacts on both habitat patch size and connectivity. By creating open areas or patches with unsuitable vegetation types, this activity could impede some wildlife species from moving between patches of habitat along the channels (e.g., species may be less willing to move through areas where vegetation is sparse or absent as it increases their susceptibility to predation). However, proposed activities are unlikely to create complete barriers to movement. Further, the installation of rock slope

protection could potentially provide escape cover for small mammals, reptiles, and amphibians moving along the channels.

New floodwalls are also proposed for the area south of Caribbean Drive. Installation of new floodwalls has the potential to impede wildlife movement across the channels. However, south of Caribbean Drive, the channels are surrounded on both sides by heavy urban development; thus, the frequency of wildlife movement across channels is expected to be low as habitat values on both sides of the channels are similarly low. Further, in this area wildlife use is already limited to common, urban-adapted species, which would continue to be able to access the channels by moving upstream or downstream to locations without floodwalls. Many urban-adapted species (i.e., mice, squirrels, raccoons, and western fence lizards) would also be able to climb the floodwalls to access the channels.

Downstream/north of their crossings with Caribbean Drive, the Sunnyvale Channels are more vegetated, have been subjected to lower levels of disturbance, and are surrounded by more open and less developed San Francisco Bay-associated habitats, thus providing higher-quality wildlife habitat. Therefore, no rock slope protection and only limited earthen channel restoration and bench construction activities are proposed in this area as the Project has been designed to prevent breaking existing environmental corridors into smaller disconnected sections. As a result, wildlife movement along the channels would not be substantially affected.

For animals that can swim the channels and thus cross perpendicular to these channels in their current condition, floodwalls would impede wildlife movement across the East Channel north of Caribbean Drive, and in the limited reach of the West Channel north of Carl Road. However, some of these animals (such as raccoons) can likely scale the new floodwalls. Where they overlap on the same side of the channel, inboard and outboard floodwalls would extend for no more than 120 feet from the nearest road crossing (i.e., Caribbean Drive or Carl Road). Thus, the presence of both an inboard and outboard floodwall is not expected to substantially increase the effect of floodwalls on wildlife movement. Further, the majority of the central portions of the Sunnyvale Channels north of Caribbean Drive would not be lined with inboard floodwalls. Thus, wildlife would continue to have access across the channel. Where floodwalls would be located, wildlife dispersing perpendicular to the channels would have to travel around the floodwalls instead of traveling directly across the channels. However, many terrestrial species, such as western fence lizards, gray foxes, and black-tailed jackrabbits, are unlikely to swim these channels even in their existing conditions. Rather, these species are expected to cross the channels at existing crossings, such as at Carl Road, Caribbean Drive, or the footbridge over the East Channel. Not only would these crossings remain in place, they are located where there would be gaps in the proposed floodwalls, so that animals moving over these bridges would be able to travel from one side of the channel to the other as they currently do.

Along the East Channel next to the salt marsh harvest mouse/wetland mitigation site, the existing maintenance road levee would be raised. By raising the levee at this location, wildlife could move up and over the levee and continue moving across the East Channel.

Applicable Best Management Practices

No District BMPs are applicable to this impact.

Conclusion

While Project activities are expected to impact wildlife movement both along and across the channel, for the reasons stated above, the Project is not expected to interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors. Wildlife movement would still be able to occur along the channels much as it currently does, and in the areas north of Caribbean Drive, where some level of wildlife movement perpendicular to the channels currently occurs on more than a very local scale, road crossings of the channels would coincide with gaps in the floodwalls, thus allowing terrestrial animals that currently cross these channels to be able to continue crossing where there are gaps in the floodwalls. Therefore, impacts to wildlife movement are considered less-than-significant.

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Chapter 3.4

Cultural Resources

3.4.1 Introduction

This section describes the environmental and regulatory setting for cultural resources. It also describes impacts on cultural resources that would result from implementation of the Project and mitigation for significant impacts where feasible and appropriate. A summary of impacts and mitigation measures is presented at the end in Chapter 3.4, “Summary of Cultural Resources Impacts.”

3.4.2 Regulatory Setting

Federal Regulations

National Historic Preservation Act/Section 106

The National Historic Preservation Act (NHPA) of 1966, as amended, requires federal agencies to consider the preservation of historic and prehistoric resources. The NHPA authorizes the Secretary of the Interior to expand and maintain a National Register of Historic Places (NRHP), and it has established an Advisory Council on Historic Preservation (ACHP) as an independent federal entity. Section 106 of the Act requires federal agencies to take into account the effects of their undertakings on historic properties and afford the ACHP a reasonable opportunity to comment on the undertaking before licensing or approving the expenditure of funds on any undertaking that may affect properties listed, or eligible for listing, in the NRHP.

Federal review of projects is normally referred to as the Section 106 process. The Section 106 review normally involves a four-step procedure described in detail in the implementing regulations (36 CFR Part 800):

- identify and evaluate historic properties in consultation with the State Historic Preservation Officer (SHPO) and interested parties;
- assess the effects of the undertaking on properties that are eligible for inclusion in the NRHP;
- consult with the SHPO, other agencies, and interested parties to develop an agreement that addresses the treatment of historic properties and notify the ACHP; and
- proceed with the project according to the conditions of the agreement.

Advisory Council on Historic Preservation Regulations, Protection of Historic Properties

The Advisory Council Regulations, Protection of Historic Properties (36 CFR 800) establish procedures for compliance with Section 106 of the NHPA of 1966. These regulations define the Criteria of Adverse Effect, define the role of the State Historic Preservation Officer (SHPO) in the Section 106 review process, set forth documentation requirements, and describe procedures to be followed if significant historic properties are discovered during implementation of an undertaking. Prehistoric and historic resources deemed significant (i.e., eligible for listing in the NRHP, per 36 CFR 60.4) must be considered in project planning and construction. The responsible federal agency must submit any proposed undertaking that may affect NRHP-eligible properties to the SHPO for review and comment before the project's approval.

Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines

Archaeology and Historic Preservation, Secretary of the Interior's Standards and Guidelines (FR 190:44716–44742) offer non-regulatory technical advice about the identification, evaluation, documentation, study, and other treatment of cultural resources. Notable in these guidelines are the “Standards for Archaeological Documentation” (p. 44734) and “Professional Qualifications Standards for Archaeology” (pp. 44740–44741).

Section 106 of the NHPA prescribes (at 36 CFR Section 800.5) specific criteria for determining whether a project would have an adverse effect on a historic property, if any such properties exist in the Area of Potential Effects (APE) as defined by the agency. An impact is considered adverse when prehistoric or historic archaeological sites, structures, districts, or objects listed in or eligible for listing in the NRHP are subjected to the following effects:

- physical destruction of or damage to all or part of the property;
- alteration of a property;
- removal of the property from its historic location;
- change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
- neglect of a property that causes its deterioration; and
- transfer, lease, or sale of the property.

Because the District would need to obtain a permit from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act, the Proposed Project constitutes a

federal undertaking that would require compliance with Section 106 of the NHPA, and federal significance criteria apply. For federally permitted or funded projects, cultural resource significance is evaluated in terms of eligibility for listing in the NRHP. NRHP criteria for eligibility are defined as follows:

The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association, and that:

- are associated with events that have made a contribution to the broad pattern of our history;
- are associated with the lives of people significant in our past;
- embody the distinct characteristics of a type, period, or method of construction, that represent the work of a master, that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- have yielded, or are likely to yield, information important in prehistory or history.

State Regulations

CEQA and Cultural Resources

CEQA applies to all discretionary projects undertaken or subject to approval by the state's public agencies (CCR 14[3] § 15002[i]). CEQA states that it is the policy of the State of California to:

...take all action necessary to provide the people of the state with...historic environmental qualities...and preserve for future generations examples of the major periods of California history (California Public Resources Code [PRC] § 21001(b), (c)). A project with an effect that may cause a substantial adverse change in the significance of a historical resource is a project that may have a significant effect on the environment (CCR 14(3) § 15064.5(b)).

The State CEQA Statute and Guidelines include procedures for identifying, analyzing, and disclosing potential adverse impacts on historical resources, which include all resources listed in or formally determined eligible for listing in the California Register of Historical Resources (CRHR) or local registers.

CEQA requires that historical resources, which include architectural resources and prehistoric and historic-era archaeological resources, be taken into consideration during the CEQA planning process (CCR 14.3 § 15064.5; PRC § 21083.2). If feasible, adverse

effects on historical resources must be avoided, or the effects mitigated (CCR 14[3] § 15064.5 [b][4]). The significance of a historical resource is impaired when a project demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for the CRHR.

California Public Resources Code

As part of the determination made pursuant to Sections 21083.2 and 21804.1 of the PRC, the lead agency shall determine whether the project may have a significant effect on archaeological and historic architectural resources.

CEQA defines a “historical resource” as a resource that meets any of the following criteria:

- A resource listed in, or determined to be eligible for listing in, the CRHR (PRC § 5024.1, CCR 14.3, § 4850 et seq.);
- A resource included in a local register of historical resources, as defined in Public Resources Code Section 5020.1(k);
- A resource identified as significant (e.g., rated 1–5) in a historical resource survey meeting the requirements of Public Resources Code Section 5024.1(g); and/or
- Determined to be a historical resource by a project’s lead agency, as defined in Public Resources Code Section 5020.1(j) or § 5024.1 (CCR 14.3 § 15064.5(a)(4).

Any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be a historical resource (CCR 14.3 § 15064.5[a][3]).

If the cultural resource in question is an archaeological site, CEQA requires that the lead agency first determine if the site is a historical resource (as defined in CCR 14.3 §15064.5[a]). If the archaeological site can be defined as a historical resource, then potential adverse impacts must be considered in the same manner as a historical resource, rather than as a unique archaeological site (see criteria below). If the archaeological site does not qualify as a historical resource, but does qualify as a unique archaeological site, then the archaeological site is treated in accordance with PRC section 21083.2.

CEQA defines a “unique archaeological resource...[as] an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the

current body of knowledge, there is a high probability that it meets one or more of the following criteria.

- 1) Contains information needed to answer important scientific research questions, and there is a demonstrable public interest in that information.
- 2) Has a special and particular quality, such as being the oldest of its type or the best available example of its type.
- 3) Is directly associated with a scientifically recognized important prehistoric or historic event or person (PRC § 21083.2[g]).”

If an impact on a historical resource or unique archaeological resource is significant, CEQA requires feasible measures to minimize the impact. Mitigation of significant impacts must lessen or eliminate the physical impact that the project will have on the resource. Generally, the use of drawings, photographs, and/or displays does not mitigate the physical impact on the environment caused by demolition or destruction of an architectural resource.

California Register of Historical Resources

The CRHR is a guide to cultural resources that must be considered when a government agency undertakes a discretionary action subject to CEQA. The CRHR helps government agencies identify and evaluate California’s cultural resources and indicates which properties are to be protected, to the extent prudent and feasible, from substantial adverse change (PRC § 5024.1[a]). Any resource listed in, or eligible for listing in the CRHR is to be considered during the CEQA process.

A cultural resource is evaluated under four CRHR criteria to determine its historical significance. A resource must be significant in accordance with the one or more of the following criteria (as defined in section 15064.5[a] [3]).

1. It is associated with events that have made a significant contribution to the broad pattern of California’s history and cultural heritage.
2. It is associated with the lives of persons important in our past.
3. It embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
4. It has yielded, or may be likely to yield, information important in prehistory or history.

CRHR criteria are tied to CEQA, and any resource that meets the above criteria and retains sufficient historic integrity (see criteria below) is considered a historical resource under CEQA.

In addition to meeting one or more of the above criteria, the CRHR requires that sufficient time must have passed to allow a “scholarly perspective on the events or individuals associated with the resource.” Fifty years is used as a general estimate of the time needed to understand the historical importance of a resource (CCR 14[11.5] § 4852 [d][2]). The California Office of Historic Preservation (OHP) recommends documenting, and taking into consideration in the planning process, any cultural resource that is 45 years or older (OHP 1995).

The CRHR also requires an eligible resource to possess integrity, which is defined as “the authenticity of a historical resource’s physical identity evidenced by the survival of characteristics that existed during the resource’s period of significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling, and association” (CCR § 4852 [c]). A resource must possess two, and usually more, of these kinds of integrity, depending on the context and the reasons the property is significant.

Resources that are significant, meet the age guidelines, and possess integrity will generally be considered eligible for listing in the CRHR.

Local Regulations

The following includes the various goals, policies, actions, programs, implementation strategies, and ordinances that address cultural resources in the city of Sunnyvale. Only information considered relevant to the Proposed Project is included.

City of Sunnyvale General Plan

The following community character goals and policies contained in the *Sunnyvale General Plan* (City of Sunnyvale 2011) are relevant to the Proposed Project:

Community Character – Heritage Preservation

Goal CC-5: To enhance, preserve and protect Sunnyvale’s heritage including natural features, the built environment and significant artifacts.

Policy CC-5.1: Preserve existing landmarks and cultural resources and their environmental settings.

Policy CC-5.2: Enhance the visual character of the City by preserving diverse as well as harmonious architectural styles, reflecting various phases of the City’s historical development and the cultural traditions of the past and present residents.

Policy CC-5.3: Identify and work to resolve conflicts between the preservation of historic resources and alternative land uses.

Policy CC-5.5: Archaeological resources should be preserved whenever possible.

3.4.3 Environmental Setting

This section provides a summary of the existing conditions and relevant pre-historical and historical regional conditions related to cultural resources in the general Project Area.

Current Conditions

The Proposed Project is set within a mixed commercial and residential area of the city of Sunnyvale. The Sunnyvale Caltrain Station is located approximately 3,000 feet west of the Project Area, at the corner of South Sunnyvale and West Evelyn Avenues. The Project Area comprises the Sunnyvale East and West Channels, which were not engineered to follow historic creek alignments. The immediately surrounding land uses include the Baylands to the north, industrial areas surrounding the Sunnyvale West Channel Project Area, industrial areas along the Sunnyvale East Channel Project Area north of State Route (SR) 237, the Alviso Freeway and commercial and residential along the Sunnyvale East Channel.

Prehistory

Milliken et al. (2007) present a series of culture changes in the San Francisco Bay Area (Bay Area). Between 11500 and 8000 cal B.C., Clovis big-game hunters, then initial Holocene gatherers, presumably lived in the San Francisco Bay region. This time period lacks evidence, presumably because most of it has been washed away by stream action, buried under more recent alluvium, or submerged on the continental shelf (Rosenthal and Meyer 2004:1).

The Early Holocene (Lower Archaic), 8000–3500 cal B.C.

Between 8000 and 3500 cal B.C., the Bay Area was occupied by a widespread but sparse hunter-gatherer population. The millingslab, handstone, and a variety of large projectile points all emerged during this period (Milliken et al. 2007:114). The Metcalf Creek Site (SCL-178), a deeply stratified deposit in the southern Santa Clara Valley, yielded cultural materials as deep as 29.5 feet below the surface (Hildebrandt 1983), and radiocarbon determinations from a feature and an *Olivella biplicata* spire-lopped bead indicate the presence of cultural materials dating as early as 7500 cal B.C. (Fitzgerald and Porcasi 2003; Fitzgerald et al. 2005).

The Early Period (Middle Archaic), 3500–500 cal B.C.

Several technological and social developments characterize this period in the Bay Area. The mortar and pestle were first documented in the Bay Area shortly after 4000 B.C., and by 1500 cal B.C., cobble mortars and pestles were widespread. The earliest cut bead horizon, the *Olivella* grooved rectangle (Vellanoweth 2001), bracketed 3400 to 2500 cal B.C., is represented by a single bead from the San Bruno Mound (Clark 1998:127, 156). Double-perforated *Haliotis* rectangle beads were first documented at the 5,590-year-old Sunnyvale Red Burial (SCL-832), which exhibited pre-interment burning (Cartier 2002).

Lower Middle Period (Initial Upper Archaic), 500 cal B.C. to cal A.D. 430

During this period, rectangular shell beads disappeared from the Bay Area, and a whole new suite of decorative and presumed religious objects appeared during the Early Period-Middle Period Transition (EMT) (Elsasser 1978), which corresponds to the beginning of this period. In the South Bay, the millingslab-handstone-oriented forager economy continued along the Pacific Coast of San Mateo County (Hylkema 2002:261).

Upper Middle Period (Late Upper Archaic), cal A.D. 430 to 1050

Around 430 A.D., the *Olivella* saucer bead trade network collapsed, and over half of the known bead horizon M1 sites were abandoned, while the remaining sites saw a large increase in sea otter bones. In the South Bay, the Meganos mortuary complex spread from the interior into the Santa Clara Valley at Wade Ranch (SCL-302) (Milliken et al. 2007:116).

Initial Late Period (Lower Emergent), cal A.D. 1050 to 1550

Fredrickson (1973) coined the term “emergent” to describe this period, characterized by a new level of sedentism, status ascription, and ceremonial integration in lowland central California. In the San Jose and Point Año Nuevo Localities, local Franciscan chert remained the primary production material for debitage and casual tools, and Napa Valley obsidian remained the primary production material for projectile points (Bellifemine 1997:124–136; Clark and Reynolds 2003:8; Hylkema 2002:250).

Terminal Late Period: Protohistoric Ambiguities

Changes in artifact types and mortuary objects characterized cal A.D. 1500–1650. The signature *Olivella* sequin and cup beads of the central California L1 bead horizon abruptly disappeared. Another upward cycle of regional integration was likely commencing when it was interrupted by Spanish settlement in the Bay Area, beginning in 1776. Such regional integration was a continuing characteristic of the Augustine Pattern, most likely brought to the Bay Area by Patwin speakers from Oregon, who introduced new tools (such as the bow) and traits (such as pre-interment grave pit burning) into central California.

Ethnography

Sunnyvale is situated within a territory once occupied by Costanoan (also commonly referred to as Ohlone) language groups. Eight Ohlone languages were spoken in the area from the southern edge of the Carquinez Strait to portions of the Big Sur and Salinas Rivers south of Monterey Bay and approximately 50 miles inland from the coast. Sunnyvale lies on the approximate ethnolinguistic boundary between the Tamyen and Ramaytush languages. Tamyen, or Santa Clara Costanoan, was spoken around the south end of the Bay and in the lower Santa Clara Valley, and seems to have had about 1,200 speakers. Ramaytush, or San Francisco Costanoan, was spoken by about 1,400 people in San Mateo and San Francisco Counties (Levy 1978:485).

Ohlone territories were composed of one or more land-holding groups that anthropologists refer to as “tribelets.” The tribelet consisted of a principal village occupied year-round, with a series of smaller hamlets and resource gathering and processing locations occupied intermittently or seasonally (Kroeber 1955:303–314). The closest known tribelet settlements to Sunnyvale are believed to be the *puyson* (Arroyo de San Francisco) and San Jose Cupertino (King 1978:437–438; Levy 1978:485). Milliken has also proposed that the *Tamien* tribe held the flatlands westward from the Guadalupe River to the present town of Cupertino on upper Stevens Creek (Milliken 1995:256), which would also include the present boundaries of Sunnyvale.

Seven Spanish missions were founded in Ohlone territory between 1776 and 1797. When the first mission was established in Ohlone territory in 1776, the Ohlone population was estimated to be 10,000. By 1832, the Ohlones numbered fewer than 2,000 as a result of introduced disease, harsh living conditions, and reduced birth rates (Cook 1943a, 1943b in Levy 1978:486). Ohlone recognition and assertion began to move to the forefront during the early 20th century, enforced by legal suits brought against the United States government by Indians of California (1928–1964) for reparation due them for the loss of traditional lands. The Ohlone participated in the formation of political advocacy groups, which brought focus upon the community and reevaluation of rights due its members (Bean 1994:xxiv). In recent years, the Ohlone have become increasingly organized as a political unit and have developed an active interest in preserving their ancestral heritage. Many Ohlones are active in maintaining their traditions and advocating for Native American issues.

History

City of Sunnyvale

Most of the Mexican land grants in the Santa Clara Valley, as in the rest of California, were judged invalid when California became a state. The earliest rancho that encompassed the Sunnyvale area was the Rancho Pastoria de las Borregas, granted in 1849 to Martin Murphy, Jr., who turned it into a wheat farm. In 1864, the Central Railroad

built a line from San Francisco to San José. Walter Everett Crossman purchased a portion of Murphy's land grant around the train station in 1897 and subdivided his property for the promotion of homes, businesses, and industry. He named his community Sunnyvale in 1901. The city only became successful in developing industry following the 1906 earthquake, when Crossman convinced Hendy Iron Works to relocate to Sunnyvale from San Francisco with the offer of free land. The first industries, Hendry Ironworks and the Libby Cannery, were both located in the town center near the Central Railroad. Housing was also located downtown and was laid out in a traditional grid pattern. The City of Sunnyvale (City) became incorporated in 1912 (Cerny 2007:185; City of Sunnyvale 2011).

By the end of World War II, Sunnyvale had fully transitioned from an agricultural community to an industrial center, with its economy focused on defense and aerospace industries, including Naval Air Station Sunnyvale (now Moffett Federal Airfield). This population and economic growth continued through the 1950s to the 1970s (City of Sunnyvale 2011). In the post-war period, urban and suburban development patterns in Sunnyvale included industrial and office park districts in the north, older residential areas and the commercial downtown in the center, large commercial development along El Camino Real and San Antonio Road, and large single-family neighborhoods south of El Camino Real (Payne 2008:175; Santa Clara County 2012:46–47; Laffey Architectural Archives 1992).

Starting in the 1980s, Sunnyvale's economy again shifted focus, from defense and aerospace industries to the high-tech industry. Because Sunnyvale is located in the heart of Silicon Valley, which is recognized as a world center for high technology innovation, Sunnyvale has identified itself as "the Heart of Silicon Valley" (City of Sunnyvale 2011).

Sunnyvale Channels

Floods caused damage in Sunnyvale in 1940, 1942, and 1943. A flood around Christmas in 1955 damaged thousands of homes, leaving residents homeless (SCVWD 2012). In response to this flooding, the SCVWD constructed the Sunnyvale Channels between 1959 and 1976. The channels were designed with a capacity to convey runoff from the 10-year storm event. Since construction of the channels, the Project Area experienced flooding during major storm events in 1963, 1968, 1983, 1986, and 1998.

The Sunnyvale Channels are engineered water conveyance channels that collect and transport stormwater runoff from urban areas in the cities of Sunnyvale and Cupertino to the southern portion of the Bay. The Sunnyvale Channels are primarily open-water channel features, with subsurface culverts and road crossings in several locations. Unlike many of the flood control channels in Santa Clara County, where engineered systems replaced a historic creek alignment, the Sunnyvale Channels are not located in the vicinity of a historic creek. Between the early 1900s and 1950s, land surface

subsidence caused by groundwater extraction from artesian wells and groundwater pumping altered the areas drainage. Consequently, runoff from portions of the watershed that would have drained to Stevens Creek or Calabazas Creek became isolated and ponded, and caused flooding.

In response to this flooding, the District constructed the Sunnyvale Channels between 1959 and 1976. The channels were designed with a capacity to convey runoff from the 10-year storm event (an event with a 10% likelihood of occurring in any given year). Since construction of the channels, the Project Area experienced flooding during major storm events in 1963, 1968, 1983, 1986, and 1998 (Santa Clara County Flood Control and Water District 1959–1976).

Known Cultural Resources

Cultural Resources Background Records Search

Bibliographic references, previous survey reports, historic maps, and archaeological site records pertaining to the Project Area were compiled through a records search of the California Historical Resources Information System (CHRIS) to identify prior studies and known cultural resources within a 0.25-mile radius of the proposed Project Area. This records search, conducted in October 2012 at the Northwest Information Center (NWIC) in Rohnert Park, revealed the following information:

Sunnyvale West Channel

No previously recorded resources were identified within the West Channel Project Area. Two previously recorded resources were identified within 0.25-mile of the West Channel Project Area.

P-43-00032 (CA-SCL-12/H): the site is a large prehistoric midden site known as the Ynigo Mound. It was originally recorded in 1912 and a variety of artifacts, including lithics, faunal bone, shell, beads, groundstone, and ecofacts, as well as human bone, were observed. The site has suffered from nearly a century of development, however, and much of the material observed during investigations in 2009 that were outside of the original site boundary did “not appear to represent intact site deposit” (Byrd and Berg 2009). This site is located about 0.25-mile west of the West Channel near the intersection of U.S. Highway (Hwy) 101 and SR 237. Project Area.

- P-43-00028 (CA-SCL-8) is a former occupation site. The site record (from 1912) states that the possibility of destruction was “considerable” (Loud 1912b). This resource was located along East Evelyn Avenue, with the western extent extending into the East Channel Project Area. This are
- P-43-00048 (CA-SCL-28) is a former occupation site. The site record (from 1912) states that the mound had already been leveled by that time (Loud

1912a). This resource is located about 0.25-mile south of the West Channel in an industrial park.

Sunnyvale East Channel

- Three previously recorded resources were identified within the East Channel Project Area P-43-00028 (CA-SCL-8) is a former occupation site. The site record (from 1912) states that the possibility of destruction was “considerable” (Loud 1912b). This resource was located along East Evelyn Avenue, with the western extent extending into the East Channel Project Site. This area now consists of the St. Jude Medical Center and associated parking lot.
- P-43-00029 (CA-SCL-9) is another former occupation site, originally noted by Nelson, and recorded by Loud (1912c). This resource was located along North Wolfe Avenue at the East Channel. In addition to the East Channel, this area now consists of an industrial complex and associated parking lot.
- P-43-000928 consists of the California Department of Transportation and Santa Clara Valley Transportation Authority (Caltrans-VTA) Rail Line, also known as the Peninsula Commute Service. The rail line crosses over the East Channel, south of Kefir Road.

Four additional previously recorded resources were identified within 0.25-mile of the East Channel Project Area.

- P-43-002193 (CA-SCL-863) consists of the remains of a single prehistoric Native American female, and a single bone from another individual. This resource was recorded on the west side of Kifer Road, about 0.25-mile from the East Channel, in an area now consisting of townhouses.
- P-43-001172 (CA-SCL-830) consists of a single prehistoric burial. This resource was located in the middle of Fair Oaks Avenue during trenching, about 0.25-mile west of the East Channel.
- P-43-001804 consists of the Schliecker Home, a Victorian and Colonial Revival residence built in 1910. It is located about 0.25-mile west of the East Channel, on Old San Francisco Road.
- P-43-001263 consists of a Craftsman-style residence built in 1906. It is located about 0.125-mile west of the East Channel on Dunnock Way.

Nine studies have been conducted within the West Channel Project Area, and an additional 15 have been conducted within 0.25-mile search radius. Twenty-two studies have been conducted within the East Channel Project Area, and an additional 12 studies have been conducted within 0.25-mile search radius. The studies include a

variety of regional overviews, site-specific studies, and archaeological surveys for a variety of projects throughout the city of Sunnyvale and Santa Clara County.

Field Survey

The archaeological and architectural field survey was conducted on January 18, 2013. The results from these surveys are presented below.

Archaeology

Sunnyvale East Channel

The East Channel and the surrounding area was inspected (to the extent possible, but with constraints of limited access and limited visibility) for indications of human activity such as stained midden soils, stone artifacts, historic artifacts, dietary shell and bone, and unnatural depressions or mounds. The majority of the area surrounding the East Channel is located in an urban environment, developed with industrial and commercial business, residences, and parking lots and other paved areas with little or no natural vegetation. Much of the East Channel is protected from neighboring residences and businesses by a fence; however, the northern part of the Channel is characterized by wide, open land along the San Francisco Bay Trail (Bay Trail).

Four Project staging areas are located outside of the East Channels Project Area (referred to by Easement reference number in Table 2-2 and Figure 3.9-1). Easement 15, located south of the Bay Trail and west of the Twin Creeks Sports Complex, consists of vacant grassland. Easements 12, 10, and 14 consist of an unpaved dirt trail with sparse tree cover adjacent to the East Channel in a residential area, and also consist of a vacant parcel of land just north of the John W. Christian Greenbelt. Easement 17, near SR 237, consists of two fenced-in, unpaved, partially graveled vacant lots with some shrubs and low-lying grasses.

No archaeological resources were observed in or near the East Channel or staging areas proposed outside of the East Channel Project Area.

Sunnyvale West Channel

The West Channel, like the East Channel, is a human-made engineering system that does not follow historic creek alignments. It is also located in an urban environment surrounded by industrial and commercial businesses, residences, and parking lots and other paved areas with little to no natural vegetation. As with the East Channel, the West Channel and the surrounding area were inspected for any and all indications of human activity.

Two contiguous proposed Project staging areas for the West Channel (Easements 13 and 14) are located adjacent to the Yahoo! Complex, bordered by West Java Drive to the south and Bordeaux Drive to the north and east. The area is fenced in and consists

of a roughly rectangular strip of vacant land with some shrubs, trees, and low-lying grasses.

No archaeological resources were observed in or near the West Channel or staging areas proposed outside of the West Channel Project Area.

Built Environment

Sunnyvale East Channel

Construction on the East Channel began in 1961. The portion from Bayshore Freeway to El Camino Real was constructed in 1966, the portion from El Camino Real to Junipero Serra Freeway in 1967, and the entire east channel was completed by 1979. The East Channel was confirmed as being less than 50 years of age by a qualified Architectural Historian. No other industrial, commercial, or residential properties affected by the Project were identified as being over 50 years of age. The proposed staging areas/easements (as discussed above) consist of unpaved dirt trails and/or vacant parcels of land and do not contain any built resources. No historical resources were observed in or near the East Channel or the proposed staging areas outside of the East Channel Project Area.

Sunnyvale West Channel

The West Channel north from Bayshore Freeway (Hwy 101) to the Moffett Channel was constructed in 1959, and the West Channel south of Hwy 101 was constructed by 1964. The West Channel north of Hwy 101 was confirmed as being over 50 years of age and the portion south of 101 as being less than 50 years of age, by a qualified Architectural Historian.

Because a portion of the Channel is over 50 years of age, both the Sunnyvale Channels have been formally evaluated for their historic significance and were not found to be historic resources for the purposes of Section 106 of the NHPA or CEQA.

The Sunnyvale Channels do not appear to be eligible for listing individually or as part of a historic district in the NRHP or CRHR. The Sunnyvale Channels are not associated with any events important in national, regional, or local history and do not appear eligible for listing in the NRHP under Criterion A, or the CRHR under Criterion 1. They are not associated with any persons important in national, regional or local history and do not appear eligible for listing in the NRHP under Criterion B or the CRHR under Criterion 2. The channels do not embody a distinctive characteristic of its type, are not the works of a master architect or builder, and do not possess high artistic value; therefore, they do not appear eligible for listing in the NRHP under Criterion C or the CRHR under Criterion 3. The Channels are not likely to yield information important to pre-history or history, and do not appear eligible for listing in the NRHP under Criterion D or the CRHR under Criterion 4. In accordance with the guidelines set forth in Section 106 and CEQA, a detailed evaluation of the Sunnyvale Channels can be found in a California Department

of Parks and Recreation (DPR) 523 Forms as attachment D to **Appendix E** (the *Sunnyvale East and West Channel Flood Protection Project Cultural Resources Technical Report*) of this report.

No other industrial, commercial, or residential properties affected by the Project were identified as being over 50 years of age. The proposed staging areas for the West Channel consists of vacant land and does not contain any built resources. No historical resources were observed in or near the West Channel or the proposed staging areas outside of the West Channel Project Area.

3.4.4 Impact Analysis

Criteria for Determining Significance

A Project impact would be considered significant if construction or operation of the proposed Project would:

- a) Cause a substantial adverse change in the significance of a historical or archaeological resource as defined in State CEQA Guidelines section 15064.5.
- b) Directly or indirectly destroy a unique paleontological resource or site.

Methodology

Impacts on cultural resources are evaluated based on a comparison of the location of known cultural resources, as determined from a records search and field survey of the Project Area and discussed above.

The Sunnyvale Channels were not found to be eligible for listing in the NRHP and the CRHR under any of the above applicable criteria and, therefore, are not historic resources for the purposes of CEQA. The results of the evaluation of these channels are detailed in the DPR 523 forms, which can be found in attachment D of **Appendix E** of this EIR.

There were no other historic resources identified on the Project Area. Therefore, the Project would not affect historic properties or cause a substantial adverse change to historical resources (historic architectural/engineering resources). Therefore, no impact would occur on historical resources, and they are not analyzed further.

Project maintenance would occur as needed and may require routine maintenance activities, such as occasional sediment removal and vegetation management, from within the Sunnyvale Channels. Potential impacts due to stream maintenance activities are addressed by the District's Stream Maintenance Program Subsequent EIR (refer to

Chapter 2.0, “Project Description”). The Stream Maintenance Program Final Subsequent EIR is available for review online: <http://valleywater.org/SMPSEIR2011.aspx>. See Volume 2, Chapter 3, Section 3.4 for the Cultural Resources impact discussion.

Environmental Impacts

The impact discussions below are structured as follows. First, the environmental impacts of the Proposed Project in the absence of best management practices (BMPs) are discussed. The discussion then presents applicable District BMPs that would avoid or minimize the level of impact. A conclusion regarding the significance of the environmental impact is then made (considering implementation of the District BMPs, as applicable). If the impact would be significant even with use of BMPs, mitigation measures (MMs) are prescribed. The residual significance of each impact following application of the MMs is then provided.

Impact CUL-1: Potential Discovery and Adverse Effect on Unknown Historic or Archaeological Resources – Less than Significant

Ground-Disturbing Activities

As discussed in the “Methodology” section above, several previously recorded cultural resources, including prehistoric occupation sites, were identified in proximity to both Sunnyvale Channels during the background records search. Although the Sunnyvale Channels are located in built-up residential and commercial areas, the potential exists for previously undiscovered cultural resources to be encountered during ground-disturbing activities associated with the Project. The Project includes ground-disturbing activities for floodwall excavation, bridge/culvert reconstruction, maintenance road improvements, levee enlargement, outfall and wingwall concrete bank stabilization, and channel excavation from erosion repairs.

Applicable Best Management Practices

The following three BMPs are implemented by the District to protect cultural resources. The full text of each BMP is provided in Table 2-8 in Chapter 2, “Project Description.”

BMP CU-2: Stop Work and Report Archaeological, Historic or Paleontological Artifacts

BMP CU-3: Stop Work and Report Burial Finds

Conclusion

Implementation of BMPs CU-2 and CU-3, as listed above, would reduce all potential impacts on unknown prehistoric and historic archaeological resources to a less-than-significant level, should such resources be discovered during project-related ground-disturbing activities.

Impact CUL-2: Potential Discovery and Adverse Effect on Paleontological Resources – Less than Significant

The Proposed Project could affect unknown paleontological resources during ground-disturbing or excavation activities. However, because the Sunnyvale Channels are engineered channels and native soils within the Project Area have most likely been covered by imported soil or otherwise modified from their natural condition, they would not be expected to contain geologic material or paleontological resources. As such, the discovery of paleontological resources during Proposed Project activities is extremely unlikely. However, activities that would result in excavation of native soils, such as bank stabilization, could uncover previously undiscovered paleontological resources.

Applicable Best Management Practices

BMP CU-2 would be implemented by the District to protect cultural resources. The full text of BMPs is provided in Table 2-8 in Chapter 2, "Project Description."

BMP CU-2: Stop Work and Report Archaeological, Historic or Paleontological Artifacts

Conclusion

Implementation of BMP CU-2 would include stop-work and treatment measures in the event of discovery of paleontological resources. As a result, this impact would be less than significant.

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Chapter 3.5

Geology and Soils

3.5.1 Introduction

This chapter describes the potential environmental impacts on geology and soils resources as a result of the Proposed Project. The chapter also provides a description of the regulatory and environmental setting of the Project Area and immediate vicinity related to geology and soils. Where feasible, mitigation measures are identified to reduce the level of expected impacts.

The District's Capital Program Services Geotechnical Group prepared two Geotechnical Studies for the Sunnyvale Channels in 2008 (SCVWD 2008a and 2008b) and a third in 2012 (SCVWD 2012). The 2008 studies supported the overall project planning process to develop the Sunnyvale Channels project. The 2012 study was conducted to support the more specific project design process which followed the planning process. These Geotechnical Studies investigated subsurface conditions, performed engineering analyses, and developed conclusions and recommendations for flood protection components and erosion repair sites along the Sunnyvale Channels. These studies provide the basis for much of the Project Area's geologic information in this EIR. The Project Geotechnical Studies are included in the EIR as **Appendix H**.

3.5.2 Regulatory Setting

Federal Regulations

There are no federal regulations related to geology and soils that would apply to the Proposed Project.

State Regulations

Alquist-Priolo Earthquake Fault Zoning

The Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) (1972) mitigates the hazard of surface faulting with regard to structures for human occupancy. The purpose of the Alquist-Priolo Act is to regulate development on or near active fault traces to reduce the hazard of fault rupture and to prohibit most structures for human occupancy from being located across active fault traces. The act creates earthquake fault zones extending approximately 200–500 feet on either side of the mapped fault trace. No

Alquist-Priolo-designated fault zones are located within the Project Area or the immediate vicinity (200–500 feet of the channels).

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act (SHMA) of 1990 was developed to protect the public from effects of hazards caused by earthquakes, including ground-shaking, liquefaction, landslides, or other ground failure. As part of the SHMA, the state geologist delineates seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones. According to the act, the minimum level of mitigation for a project in a seismic hazard zone should reduce the rise of ground failure during an earthquake to a level that does not cause the collapse of a building intended for human occupancy. The Project Area is located within a liquefaction zone, as mapped in accordance with the SHMA. Further information is provided in the “Environmental Setting” section below.

California Building Code

The State of California’s minimum standards for structural design and construction are given in the California Building Code (CBC) (California Code of Regulations, Title 24). The CBC is based on the Uniform Building Code (UBC), which is used widely throughout United States (generally adopted on a state-by-state or district-by-district basis), and has been modified for California conditions with numerous, more detailed and/or more stringent regulations (California Building Standards Commission 2013).

The CBC requires that “classification of the soil at each building site ... be determined when required by the building official” and that “the classification ... be based on observation and any necessary test of the materials disclosed by borings or excavations.” In addition, the CBC states that “the soil classification and design-bearing capacity shall be shown on the (building) plans, unless the foundation conforms to specified requirements.” The CBC provides standards for various aspects of construction, including but not limited to excavation, grading, and earthwork construction; fill placement and embankment construction; construction on expansive soils; foundation investigations; resistance to ground shaking in various zones of the state; and liquefaction potential and soil strength loss. In accordance with California law, project design and construction would be required to comply with provisions of the CBC.

Local Regulations

The City of Sunnyvale’s (City’s) seismic safety element (Resolution No. 327-08) identifies seismic and geologic hazards within the City as a whole (City of Sunnyvale 2008). Other than conformance with the current CBC, there are no local regulations that relate to geology, soils, and seismicity in the City’s General Plan or the Sunnyvale Municipal Code.

3.5.3 Environmental Setting

Geology

Regional Geology

The Project Area is located within the Coast Ranges Geomorphic Province, a relatively geologically young and seismically active region on the western edge of the North American plate. The San Andreas and Hayward fault systems strongly influence the geology of the area. More specifically, the Project Area is located in the Santa Clara Valley, a large alluvial plain bound by the hills of the Diablo Range to the east, the Santa Cruz Mountains to the southwest, and San Francisco Bay to the north. The geology of the Santa Clara Valley generally consists of Cenozoic non-marine (continental) sedimentary rocks and alluvial deposits.

Project Area Geology

The Project Area is located on the alluvial plain below the uplands of the Santa Cruz Mountains. In general, moving northward from the mountain uplands toward San Francisco Bay, the alluvium becomes younger and less consolidated. The Union Pacific Railroad (UPRR), which traverses the Project Area in an east-west direction near the Center Expressway, acts as a general dividing line for the Project Area geology. North of the UPRR, the Sunnyvale Channels are underlain by alluvium comprised of unconsolidated stream and basin deposits, typically consisting of interbedded clays and sands. South of the UPRR, the East Channel is underlain by an older alluvium comprised of dissected alluvial deposits, which typically consist of sands with clay lenses. Bay mud deposits, or unconsolidated fine silty clay, exist north of the Bayfront Levee and along Guadalupe Slough.

Seismicity

The San Francisco Bay Area (Bay Area) is seismically active and susceptible to several types of earthquake hazards, such as ground shaking, surface fault rupture, liquefaction, landslides, tsunamis, and seiches. There is a 63% probability of one or more magnitude 6.7 or greater earthquakes occurring in the Bay Area between 2007 and 2036 (USGS 2008).

In the Santa Clara Valley, the principal active faults include the San Andreas and Hayward faults and secondary faults include the Calaveras, Monte Vista-Shannon, and Hayward (southeast extension) faults. **Table 3.5-1** shows the relative distance of the Project Area to the nearest principal and secondary faults. Other faults in the region are the San Gregorio, Evergreen, Piercy, Silver Creek, and Coyote Creek faults. Faults capable of producing the strongest ground shaking at the Project Area are Monte Vista, San Andreas, and Hayward.

Table 3.5-1. Nearest Principal and Secondary Faults to the Project Area

Fault Name	Direction from Site	Distance from West Channel	Distance from East Channel	Fault Type
Monte Vista-Shannon	Southwest	7 miles (mi)	6 mi	Secondary
Hayward (Southeast extension)	Northeast	9 mi	7 mi	Secondary
San Andreas (Peninsula)	Southwest	10 mi	9 mi	Principal
Hayward	Northeast	11 mi	10 mi	Principal
Calaveras (North)	Northeast	12 mi	11 mi	Secondary
Calaveras (South)	East	14 mi	11 mi	Secondary

Source: SCVWD 2008a and 2008b.

Geologic and Seismic Hazards

During an earthquake, certain locations can experience seismic settlement following an earthquake. Slope stability is low at certain representative reaches of the Sunnyvale Channels, while the potential for seepage flow is low, as described below. Other geologic hazards, such as lurching or fault rupture, are considered unlikely to manifest at the Project Area owing to the nature of the near surface soils, topography, and the distance of the site from known active faults.

Liquefaction

Soil liquefaction occurs when saturated soil layers located close to the ground surface lose strength during an earthquake, and increased horizontal and vertical movements can occur in response to shaking. Soils most susceptible to liquefaction are clean, loose, uniformly graded, saturated, fine-grained sands that lie relatively close to the ground surface. The risk of earthquake-induced liquefaction is present throughout the northern portion (by Pond A4) of the City of Sunnyvale.

The Project Area is located within a liquefaction zone, as mapped in accordance with the SHMA, in areas where historical occurrence of liquefaction, or local geological conditions, indicate a potential for permanent ground displacement. The SHMA liquefaction zone begins approximately 0.5 mile north of State Route (SR) 82 and continues to San Francisco Bay (California Geological Survey 2006). The SHMA liquefaction zone covers the entire West Channel and the portion of the East Channel 0.5 mile north of SR 82 to the mouth of the channel. However, during the 1989 Loma Prieta earthquake, no liquefaction or associated ground-failure effects were reported in the vicinity of the Project Area. The closest liquefaction related to the Loma Prieta earthquake was reported along the Guadalupe River in Alviso, approximately one mile east of the Project Area (SCVWD 2012).

The District evaluated the liquefaction potential for near-surface sand layers of the Sunnyvale Channels in the 2012 Geotechnical Report prepared for the Proposed Project. Borings and cone penetration testing were performed, and an estimated peak ground acceleration¹ of 0.3 g (where g is the acceleration resulting from gravity, 9.81 meters per second squared) was used to estimate the liquefaction potential of the existing soil layers. The results of the liquefaction analyses indicated that some of the sandy soils in the alluvium could potentially liquefy during an earthquake event with a 6.6 magnitude or greater. However, the liquefiable zones are likely relatively thin and not connected. The liquefiable zones could be up to 20 feet thick. The thicker layers of liquefiable materials are usually found at depths of 30 to 40 feet. No liquefiable material was found on the surface of levee slopes (SCVWD 2012).

Seismic Settlement

Following strong earthquake ground shaking, loose soil can become denser, resulting in seismic settlement. Seismic settlement varies widely along the channels. Locations relatively close to one another can have different amounts of seismic settlement, and can take different amounts of time to manifest. Seismically induced settlement was estimated to vary from 0 to 8 inches along the Sunnyvale Channels. Differential settlement along the channels can be damaging to structures supported on the loose soil (SCVWD 2012).

Slope Stability

The slope stability of the existing channels was analyzed at 14 different cross-sections by using the computer program SLOPE/W. The cross-sections were located at the Project Area along the entire length of both Sunnyvale Channels, and outside of the Project Area in the Moffett Channel, immediately to the west of Pond A4. The cross-sections were analyzed using a range of conditions based on the 30% design plans, including:

1. **Flood loading conditions**, with a short period of hydraulic loading and no significant seepage into the levee;
2. **Seismic loading conditions**, with typical groundwater levels; and
3. **Long-term conditions**, with no flood or seismic loading conditions
4. **End-of-Construction**, considers the additional loading resulting from the construction of the flood protection measures planned for each cross section.

The slope stability analysis was evaluated for existing Project Area conditions and for conditions occurring at the Project Area after development of the Proposed Project's

¹ "Estimated peak ground acceleration" is an estimate by the California Geological Survey of earthquake acceleration on the ground, or how hard the earth shakes in a given geographic area.

flood protection components—floodwalls, levee modification, and bridge/culvert modifications (referred to as the post-Project condition). A total of five analyses were evaluated, three for existing conditions and two for the post-Project condition. For each analysis, a factor of safety, or a comparison of the strength of the levee beyond existing design, was calculated. In general, a higher factor of safety indicates increased stability. A lower factor of safety indicates less stability. Based on U.S. Army Corps of Engineers (USACE) Guidelines (USACE 2000), the appropriate minimum factors of safety are 1.3 for end-of-construction and 1.4 under long-term conditions (SCVWD 2012). The long-term condition is where the water levels in the channel and groundwater levels are at normal levels. Normal channel water levels were based on field observations made during site reconnaissance and input provided by the District. Groundwater levels were estimated by reviewing available piezometer data and levels reported on boring logs. The end-of-construction conditions consider the additional loading from the construction of planned flood protection measures.

The levee/road slope stability analysis determined that, under many conditions, the levee/road slopes are stable. However, low stability was also identified, as follows (SCVWD 2012):

- In the long-term conditions analysis, the northernmost cross-section on the East Channel, located south of Pond A4 approximately at the middle of the Twin Creeks Sports Complex, was found to have a factor of safety of 1.35 on the outboard (water) side. This result indicates low stability under long-term conditions.
- In the seismic loading conditions analysis, all cross-sections evaluated along the Sunnyvale Channels were found to have a factor of safety less than 1.3. This result indicates low stability from seismic loading at cross-sections of the Sunnyvale Channels under end-of-construction and long-term conditions.

Seepage

Seepage under levees can cause levee failure. The existing levees of the West Channel near Caribbean Drive, at the bend in the West Channel to Carl Road, have experienced seepage from flows through permeable sands. A below-grade concrete cut-off wall was constructed down the center of the levees to a depth of about 18 feet to mitigate this seepage. Numerous rodent holes are present along the channel banks. These rodent holes compromise the impermeability of the levees. Based on a laboratory permeability tests on soil, the potential for seepage flow through or under existing levees is low. However, the existing banks may be susceptible to future seepage issues from rodent holes or permeable layers of sandy material in the channel banks (SCVWD 2008b).

Soils

The soil conditions of the Sunnyvale Channels were derived from a series of geotechnical test borings and cone penetration tests taken along both channels. Both

Sunnyvale Channels consist of steeply sloped banks and relatively flat adjacent lands. The channels flow through an urban area and are surrounded by residential and commercial properties on both banks. Chapter 3.8, "Hydrology, Geomorphology, and Water Quality," contains descriptions of channel conditions, including existing erosion sites and causes of erosion in the Sunnyvale Channels. The Project Area in general is underlain by alluvial depositions consisting of lean to fat clay, silty to clayey sand, and clayey gravel, with some areas more silty or clayey than others.

Along the West Channel, 14 geotechnical borings were taken, covering varied subsurface stratigraphy.

Along the East Channel, 34 geotechnical borings were taken, covering varied subsurface stratigraphy. The borings north of Old San Francisco Road typically encountered medium-stiff to very-stiff lean to fat clay, with intermixed lenses of silty to clayey sand within the upper 50 feet. Occasional loose layers of sandy soils were also encountered in the upper 45 feet. South of Old San Francisco Road, borings typically encountered stiff to very-stiff lean clay intermixed with layers of dense gravel and medium-dense to dense sand with varying clay and silt content (SCVWD 2008a).

3.5.4 Impact Analysis

Criteria for Determining Significance

For the purposes of this analysis, the Proposed Project would result in a significant impact on geology and soils if it would:

- a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury or death related to seismic motion, liquefaction, landslides, or unstable geologic or soil units;
- b) Result in substantial soil erosion or the loss of topsoil; or
- c) Directly or indirectly destroy a unique geologic feature

Topics Dismissed in the Initial Study Checklist

The Initial Study Checklist (IS) dismissed potential impacts related to the destruction of unique geologic features from further analysis. The Proposed Project is located in an urbanized area underlain by existing geological conditions, consisting of clays, silts, sand, and gravel. The underlying geologic features that would be temporarily affected by ground-disturbing activities from the Proposed Project are common to the surrounding areas. No unique geologic features have been identified in the Project Area. Therefore, no impact to unique geologic features would result.

Methodology/Approach

Potential impacts to geology, soils, seismicity and associated hazards were evaluated qualitatively in relation to the three criteria described above and based on a review of soils and geologic information for the Project Area. The potential for the Project to result in instability of channel slopes and levees was evaluated in light of the findings and recommendations of the 2012 Geotechnical Report that evaluated the

Environmental Impacts

The potential to cause soil erosion and the loss of topsoil are evaluated for areas adjacent to the East and West Channels. Issues related to sedimentation and erosion within the East and West Channels themselves are addressed in Chapter 3.8, “Hydrology, Geomorphology, and Water Quality.”

The impact discussions below are structured as follows. First, the environmental impacts of the Proposed Project in the absence of best management practices (BMPs) are discussed. The discussion then presents applicable District BMPs that would avoid or minimize the level of impact. A conclusion regarding the significance of the environmental impact is then made (considering implementation of the District BMPs, as applicable). If the impact would be significant even with use of BMPs, mitigation measures (MMs) are prescribed. The residual significance of each impact following application of the MMs is then provided.

Impact GEO-1: Potential Adverse Effects from Fault Rupture, Earthquake-Induced Liquefaction, Seismic Settlement, or Channel Slope and Levee Instability – Less than Significant

Proposed Project structures could fail as a result of earthquake-induced liquefaction or seismic loading conditions. People on the channel levee maintenance roads could be harmed if Project structures failed.

As described above in the “Environmental Setting” section, the Project Area is located in an active tectonic region and could be subject to ground shaking from earthquakes on nearby faults. Table 3.5-1 above shows the distances of the nearest principal and secondary faults to the Project Area. As the nearest fault to either channel is 6 miles away, the Project Area would not be affected by direct fault rupturing during an earthquake. However, depending on the magnitude of the earthquake and its distance away, the Sunnyvale Channels could be displaced, elevated, subsided, or otherwise moved by strong earth movement. The District has identified locations along the designated work area where up to 8 inches of seismic settlement may occur following a major earthquake, which could damage infrastructure along the channels. The stability of the existing channel slopes at all cross-sections examined was found to perform below design standards when subjected to seismic loading from earthquakes

Proposed Project structures include floodwalls, headwalls, levees raised and enlarged, and reconstructed bridges. The District would construct Project structures following standard building codes and the 2012 Geotechnical Report's recommendations (SCVWD 2012), which were developed based on site-specific geologic data to prevent risks from liquefaction and liquefaction-induced seismic settlement. The 2012 Geotechnical Report provides guidelines for site preparation, subgrade preparation, types of fill materials to be used, and placement of fill.

Levees raised and enlarged for the Project are designed to have final slopes no steeper than 2:1 (horizontal to vertical), and would be built to account for deformations and settlement during a seismic event. Floodwall footings would be embedded a minimum of 24 inches below the lowest adjacent finished grade, and would be designed using a site-specific approach based on USACE Engineering Manuals to determine bearing capacity. Guidelines are provided to improve the stability of modified and installed headwalls and wingwalls. The modified and installed headwalls and wingwalls are designed as conventional retaining walls supported on spread footings for stability, and designed to resist static and seismic lateral earth pressures.

Applicable Best Management Practices

No District best management practices (BMPs) are applicable to this impact.

Conclusion

While the underlying geology would remain unchanged, Project structures would be designed to withstand seismic-induced shaking, such that potential instability of channel slopes and levees during earthquakes is not expected to adversely affect these structures or cause failure. Therefore, persons using channel levee/roads would not be exposed to risk; this impact is considered less than significant.

Impact GEO-2: Soil Erosion and Loss of Topsoil from Project Construction Activities – Less than Significant

A variety of Project construction activities occurring within the Project Area have the potential to expose and/or loosen topsoil and cause soil erosion. The Project Area would extend approximately 25 feet outboard from the top of the channel bank along the Sunnyvale Channels, and would include the District's existing right-of-way/easements, property permanently and temporarily acquired for the Project, and the channels themselves.

Out-of-Channel Construction Activities

Project components constructed outside of the top of the channel banks include floodwalls, levee raising, maintenance road improvements, and several bridge/culvert modifications. In addition, portions of the levee enlargement would occur outside the channel.

Construction vehicles and equipment movement through areas with bare soil could disturb the topsoil, causing localized erosion or compaction. The movement of construction vehicles and equipment through the Project Area, however, would preferentially occur on existing roads to the extent possible. The majority of construction in channel easements would occur on and from the District's channel maintenance roads. These roads are generally composed of compacted gravel and are not expected to erode from any construction activities.

Construction activities for maintenance road improvements, levee raising and enlargement, and floodwall ramps would involve the placement of fill material on existing roads and undeveloped areas within channel easements. During floodwall construction, fill material would also be placed over floodwall footings installed in the area previously excavated for floodwalls. Maintenance road improvements would also involve resurfacing the road with aggregate base rock (gravel-size material). As described below, BMPs would be used to prevent erosion during these activities.

Out-of-channel construction would take place during the dry season, from May through November, to minimize the potential for runoff from rainfall that could cause erosion of loosened soil in channel easements.

Disturbed grasses and vegetation removed from channel easements would also decrease the surface roughness and potentially provide larger areas for surface runoff to concentrate and erode existing loosened soils. However, the effect is expected to be minimal because currently channel easements are primarily undeveloped and contain gravel maintenance roads, which have no surface roughness.

In-Channel Construction Activities

Project components constructed in the channels, between the top of the channel banks, include channel excavation (for rock slope protection, bench construction, bridge reconstruction, and sediment removal) and installation of rock from rock slope protection.

During channel excavation, sediment, vegetation, and existing concrete and rock slope protection would be removed from the channel. Excavation would remove substantial amounts of these materials from the channel and leave exposed soil loosened. Grading/regarding of the channel slope would be involved for development of levees and rock slope protection (in areas above the placement of rock). Grading would move around soil loosened during excavation and loosen new soil in the channel. Use of other construction equipment directly within the channel also has the potential to loosen additional soil. As described below, appropriate BMPs would be used to avoid and minimize these potential impacts.

If water is present in the channel during excavation and grading activities, loosened soil would be immediately discharged into these waters and conveyed downstream.

However, by implementing BMP WQ-12 as described below, the District would prevent water from being present in the channels by dewatering the channels and diverting water before construction at a particular location. If the channel area is dry, surface runoff during rainfall events would be discharged into the channel and would easily collect and transport loosened soil downstream in the channel.

In-channel construction would take place during the dry season, from June through October, to minimize the potential for runoff from rainfall, which could cause erosion of loosened soil in the channel. Erosion control fabric and revegetation via hydroseeding and planting would be used on regraded channel areas to minimize erosion from these areas after development of the Project. A very small amount of soil excavated from the channel may be placed within the small crevices between rock installed for rock slope protection.

Activities within Construction Staging Areas

Construction vehicles and equipment movement through staging areas with bare soil could disturb the topsoil, causing localized erosion or compaction. Soil and sediment excavated during Project construction, and which is not exported off-site, would likely be stored within some or all the construction staging areas before reuse or export off-site. Stockpiled material is vulnerable to erosion if not properly protected during and immediately after rainfall events. Several of the BMP measures described below would be implemented to prevent erosion from construction staging areas.

Applicable Best Management Practices

The District would implement the following BMPs to minimize soil erosion and the loss of topsoil during Project construction. Full text describing each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP WQ-1: Conduct Work from Top of Bank

BMP WQ-2: Evaluate Use of Wheel and Track Mounted Vehicles in Stream Bottoms

BMP WQ-4: Handle Sediments so as to Minimize Water Quality Impacts

BMP WQ-5: Avoid Runoff from Soil Stockpiles

BMP WQ-6: Stabilize Construction Entrances and Exits

BMP WQ-11: Use Cofferdams for Tidal Work Areas

BMP WQ-12: Divert/Bypass Water at Non-tidal Sites

BMP WQ-15: Manage Groundwater at Work Sites

BMP WQ-16: Avoid Erosion When Restoring Flows

BMP WQ-19: Control Emergency Discharges

BMP WQ-20: Control Unplanned Discharges

BMP WQ-27: Evaluate Use of Discharge Surface Protection – Armoring

BMP WQ-28: Evaluate Use of Discharge Surface Protection – Flow Diversion

BMP WQ-29: Evaluate Use of Discharge Storm Drain Curb & Drop Inlet Protection

BMP WQ-41: Prevent Stormwater Pollution

Conclusion

As discussed above, several Project construction activities, specifically those occurring in channel easements, in the channels themselves, and in staging areas, have the potential to expose and loosen soils, leaving them susceptible to erosion from surface runoff.

Implementation of BMPs WQ-1 and WQ-2 would reduce exposure and loosening of soil during use of construction equipment. BMP WQ-1 ensures that where possible construction work would occur from the top of bank where a gravel surface maintenance road can support construction equipment without causing erosion. BMP WQ-2 would be used to evaluate which in-channel locations can support use of construction vehicles (and what types) in order to minimize erosion or other damage within the channels. Implementation of BMP WQ-4 would direct how sediments are handled, transported, and stored so as to reduce potential erosion, and BMP WQ-5 would use erosion control measures to prevent runoff and erosion at soil stockpile locations. Implementation of BMPs WQ-11, WQ-12, WQ-15, and WQ-16 would require in-channel work sites to be dewatered before construction begins in the channel and for dewatering to occur in a manner that prevents or minimizes erosion. Implementation of BMPs WQ-19 and WQ-20 would prevent erosion from emergency discharges during Project construction activities including following the Emergency Discharge Checklist protocol, inspecting the pathway of potential emergency discharges, use of control measures to limit emergency discharges, and monitoring discharges to ensure that the emergency measures are effective. Implementation of BMPs WQ-6 WQ-27, WQ-28, WQ-29, and WQ-41 would require installation of temporary and permanent features during construction to control stormwater runoff and erosion in the Project Area.

Furthermore, as part of the Proposed Project, the District would obtain coverage under the National Pollution Discharge Eliminated System Construction General Permit from the State Water Resources Control Board. This permit requires implementation of a Stormwater Pollution Prevention Plan to control stormwater runoff within the Project Area, thus further minimizing soil erosion and transport to the extent possible.

The use of the above BMPs would ensure that potential erosion and loss of topsoil during Project construction activities would be avoided or minimized to the extent possible. Therefore, this impact is considered less than significant.

Chapter 3.6

Greenhouse Gas Emissions

3.6.1 Introduction

This chapter summarizes the potential impacts related to greenhouse gas emissions from Project construction. The chapter also provides a description of the regulatory setting and affected environment for global climate change. Where feasible, mitigation measures are identified to reduce the level of expected impacts.

3.6.2 Regulatory Setting

Federal Regulations

The U.S. Supreme Court ruled that greenhouse gases (GHGs) are air pollutants that were covered under the Clean Air Act for the first time in 2007, in *Massachusetts v. U.S. EPA* (549 U.S. 497). The Court found that the U.S. Environmental Protection Agency (EPA) was required to determine if emissions of GHGs from new vehicles cause or contribute to air pollution that may be anticipated to endanger public health or welfare. In 2009, the EPA Administrator found that the current and projected concentrations of GHGs threaten public health and welfare of current and future generations and that combined emissions from new motor vehicles contribute to GHG pollution. On August 9, 2011, EPA and the National Highway Traffic Safety Administration (NHTSA) announced standards to reduce GHG emissions and improve fuel efficiency for heavy-duty trucks and buses. On October 15, 2012, EPA and the NHTSA established a program to reduce GHG emissions and improve fuel economy standards for new cars and light trucks through 2025 (EPA 2012).

To address large stationary emitters of GHGs, EPA also established mandatory reporting of GHG emissions for facilities that emit more than 25,000 metric tons of carbon dioxide equivalent (CO₂e) emissions per year. On May 13, 2010, Clean Air Act permitting programs were tailored to cover the nation's largest GHG emitters: power plants, refineries, and cement production facilities. On March 27, 2012, EPA proposed a Carbon Pollution Standard for new power plants that would, for the first time, set limits on the amount of carbon pollution emitted by power plants (EPA 2012).

State Regulations

Assembly Bill 1493

In 2002, Assembly Bill (AB) 1493 launched an innovative and proactive approach to addressing GHG emissions and climate change at the state level. AB 1493 requires the California Air Resources Board (CARB) to develop and implement regulations to reduce automobile and light truck GHG emissions. These regulations apply to automobiles and light trucks beginning with the 2009 model year.

Assembly Bill 32 (Global Warming Solutions Act) and Scoping Plan

On June 1, 2005, then-Governor Arnold Schwarzenegger signed Executive Order S-3-05. The goal of the executive order was to reduce California's GHG emissions to (1) 2000 levels by 2010, (2) 1990 levels by 2020, and (3) 80% below 1990 levels by the year 2050. In 2006, this goal was further reinforced with the passage of AB 32, the Global Warming Solutions Act. AB 32 firmly established the goal of reaching 1990 levels by 2020, while mandating that CARB create a plan and implement rules to achieve the GHG reduction goal.

In 2008, CARB developed a Scoping Plan to achieve the reductions in GHG levels set in AB 32. The Scoping Plan proposes a comprehensive set of actions to reduce GHG emissions to 1990 levels by 2020. Key recommendations include:

- Expanding and strengthening existing energy efficiency programs as well as building and appliance standards;
- Achieving a statewide renewables energy mix of 33%;
- Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system;
- Establishing targets for transportation-related GHG emissions for regions throughout California, and pursuing policies and incentives to achieve those targets;
- Adopting and implementing measures pursuant to existing state laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard; and
- Creating targeted fees, including a public goods charge on water use, fees on high global-warming potential gases, and fees to fund the administrative costs of the state's long-term commitment to AB 32 implementation (CARB 2011a).

CARB established a cap-and-trade program to implement the Scoping Plan. The cap-and-trade program, which started on January 1, 2012, created an overall limit of GHG emissions in capped sectors by facilities. Facilities subject to the cap are allowed to trade permits, or allowances, to emit GHGs. Over time, the number of permits will decrease by sector to reduce overall GHG emissions.

CARB Approaches for Setting Greenhouse Gas Thresholds

In 2008, CARB released a preliminary draft staff proposal describing recommended approaches for setting interim significance thresholds for GHGs under CEQA. CARB focused on two common project types that result in substantial GHG emissions—specifically, industrial and residential/commercial projects. CARB created a conceptual approach by project type to develop draft GHG thresholds. For industrial projects, CARB examined a hypothetical small project using industrial boilers, because they are very common piece of equipment. The combustion emissions from the hypothetical project were used as a benchmark to define a significant combustion source. The threshold developed using this approach for industrial projects is a quantitative threshold of 7,000 metric tons of CO₂ equivalents (CO₂e) per year for operational emissions (excluding transportation). For residential/commercial projects, CARB examined the five major emissions sub-sources for the sector: energy use, transportation, water use, waste, and construction. The threshold developed for these types of projects was to follow clear and stringent performance standards for each emissions sub-source. CARB intends to develop a specified level of emissions as part of the final threshold recommendations (CARB 2008).

Local Regulations

BAAQMD CEQA Guidelines

The Bay Area Air Quality Management District (BAAQMD) developed CEQA guidelines, in 1999 and 2010, to assist local jurisdictions in evaluating potentially adverse impacts on air quality. The 2010 guidelines were further updated in 2011. The 1999 CEQA guidelines provided thresholds for air quality emissions, but did not provide thresholds for GHG emissions. In 2010, BAAQMD adopted air quality guidance which included quantitative thresholds of significance and recommended best management practices (BMPs) and mitigation measures for GHG emissions, among other pollutants.

The thresholds were developed using a “gap-based” threshold, to cover the perceived shortfall between the GHG reductions achieved with the AB 32 Scoping Plan measures and the AB 32 GHG emissions targets. The thresholds were developed based on BAAQMD’s expertise and the best available GHG emissions data, and incorporated conservative assumptions for the amount of emission reductions from legislation to cover the gap (BAAQMD 2009).

The BAAQMD CEQA guidelines did not adopt any significance thresholds for construction-related GHG emissions. Rather, BAAQMD recommended lead agencies to quantify and disclose GHG emissions that would occur during construction and to make a determination on the significance of those emission impacts in relation to meeting AB 32 GHG reduction goals. BAAQMD also encouraged lead agencies to incorporate BMPs to reduce GHG emissions during construction, as applicable. The BAAQMD CEQA Guidelines included operational-related thresholds of significance for two types of projects: land-use development and stationary-source projects. For land-use development projects, including residential, commercial, industrial, and public land uses and facilities, the threshold was compliance with a qualified GHG reduction strategy or annual emissions of less than 1,100 metric tons of CO₂e or efficiency performance criteria based on service population (BAAQMD 2010).

City of Sunnyvale Climate Action Plan

The City of Sunnyvale (City) released a draft Climate Action Plan (CAP) to identify ways in which the community and the City can address GHG emissions and adapt to the effects of climate change. The Proposed Project is not covered by the Sunnyvale CAP but is located within the community to which the CAP pertains and where it is implemented. The CAP provides an inventory of 2008 GHG emissions and addresses long-term goals for emissions reduction by setting targets that will make the City consistent with AB 32 goals. The GHG reduction strategies are organized around 10 topics: open space and urban forestry, decreasing energy consumption, providing a sustainable energy portfolio, decreasing water consumption, reducing landfilled waste, reducing off-road equipment emissions, increasing and retaining awareness of sustainability issues, improving mobility through land use planning, and expanding sustainable circulation and transportation. GHG reductions are quantified by topic for 2020 and 2035. The City released a Notice of Preparation of a Draft Environmental Impact Report for the CAP in March 2012. Although the CAP does not specifically cover the District's activities and the Proposed Project, the Project Area is located within the community relevant to the CAP. The following policies contained in the draft CAP are relevant to construction emissions:

Goal OR-2: Construction Equipment: Reduce emissions from heavy-duty construction equipment by limiting idling and utilizing cleaner fuels, equipment, and vehicles.

Action Items:

OR-2.1: Idling times would be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]), or less. Clear signage would be provided at all access points to remind construction workers of idling restrictions.

OR-2.2: Construction equipment may be maintained per manufacturer's specifications.

OR-2.3: Planning and Building staff would work with project applicants to limit GHG emissions from construction equipment by selecting one of the following measures, at a minimum, as appropriate to the construction project:

- a. Substitute electrified or hybrid equipment for diesel- and gasoline powered equipment where practical.
- b. Use alternatively fueled construction equipment on-site, where feasible, such as compressed natural gas (CNG), liquefied natural gas (LNG), propane, or biodiesel.
- c. Avoid the use of on-site generators by connecting to grid electricity or utilizing solar-powered equipment.
- d. Limit heavy-duty equipment idling time to a period of 3 minutes or less, exceeding CARB regulation minimum requirements of 5 minutes.

The total GHG reductions from implementing this goal are projected to be 7,700 metric tons of CO₂e (MTCO₂e) in 2020 and 2035 MTCO₂e in 2035 (PMC 2011).

3.6.3 Environmental Setting

Greenhouse Gases and Climate Change

Anthropogenic emissions of GHGs are widely accepted in the scientific community as contributing to global climate change. The Intergovernmental Panel on Climate Change was commissioned by the World Meteorological Organization and United Nations Environment Program to assess scientific, technical, and socio-economic information relevant to the understanding of climate change, its potential impacts, and options for adaptation and mitigation. According to *Climate Change 2007: The Physical Science Basis: Summary for Policymakers* (IPCC 2007), there is no doubt that the climate is warming. Global average air and ocean temperatures, as well as global average sea level, are rising. The period from 1995 through 2006 ranked as among the warmest on record since 1850. Although some of the increase is explained by natural occurrences, the 2007 report asserts that the increase in temperature is very likely (greater than 90%) caused by human activity, most notably from the burning of fossil fuels.

Climate change is a global problem, and GHGs are global pollutants, unlike criteria air pollutants (such as ozone precursors) and toxic air contaminants, which are pollutants of regional and local concern. GHGs include carbon dioxide (CO₂), methane (CH₄), nitrous

oxide (N₂O), and other pollutants. Emissions of CO₂ and N₂O are byproducts of fossil fuel combustion, among other sources. Methane, a highly potent GHG, results from off-gassing associated with agricultural practices and landfills, among other sources. The impacts from each of these other GHGs besides CO₂ are often converted to CO₂e, a measure of how much global warming a given type and amount of GHG may cause using the equivalent amount of CO₂. Global sinks of CO₂ include uptake by vegetation and dissolution into the ocean (IPCC 2007).

For California, projected effects from climate change are described in *Our Changing Climate: Assessing the Risks to California* (California Climate Change Center 2012). Based on projections using climate modeling, temperatures in California are expected to rise between 4.1°Fahrenheit (F) and 8.6°F by the end of the century, depending on how much California and the rest of the globe are able to reduce their GHG emissions. These temperature increases will negatively affect public health, water supply, agriculture, plant and animal species, and the coastline (California Climate Change Center 2012).

Worldwide, California is between the 13th and 14th largest emitter of CO₂ and is responsible for approximately 1% of the world's CO₂ emissions. In 2009, California emitted 457 million MTCO₂e (CARB 2011b).

To determine the projected changes in California, well-established climate models were used to project the future climate. The changes in the future climate were found to affect the natural environment in California in the following ways:

- More frequent, hotter, and longer heat waves, with fewer extremely cold nights;
- Greater numbers of large wildfires, burning larger areas;
- Reduced snow pack and stream flow from the Sierra Nevada, affecting winter recreation and water supply;
- Public health impacts from heat waves, including higher temperatures increasing ground-level ozone levels;
- Increased electricity demand for cooling in the summer and reduced energy supply from hydropower;
- Accelerated sea-level rise threatening coastal infrastructure and increasing the risk of coastal flooding to vulnerable populations;
- Changes in growing season conditions that may affect agriculture, causing variations in crop quality and yield; and/or
- Changes in distribution of plant and wildlife species because of changes in temperature, competition from colonizing species, changes in hydrologic cycles, changes in sea levels, and other climate-related effects (California Climate Change Center 2012).

These changes in California's climate and ecosystems are occurring at a time when California's population is expected to increase from 37 million to 51 million by 2050 (California Department of Finance 2012). Therefore, the number of people potentially affected by climate change, as well as the amount of anthropogenic GHG emissions anticipated under a "business as usual" scenario, is expected to increase. Similar changes as those noted above for California also are expected occur in other parts of the world, with regional variations in resources affected and vulnerability to adverse effects.

GHG emissions in California are attributable to human activities associated with industrial/manufacturing, utilities, transportation, residential, and agricultural sectors as well as natural processes. Transportation is responsible for 38% of the state's GHG emissions, followed by electricity generation (23%), industrial (20%), agriculture (7%), residential (6%), commercial (3%) and other sources (3%) (CARB 2011b).

City of Sunnyvale

The draft City of Sunnyvale CAP (PMC 2011) inventories existing sources of GHG emissions, reduction targets, and measures to achieve GHG reduction targets. The GHG emissions inventory quantifies emissions from residential energy, commercial and industrial energy, on-road transportation, waste, water, off-road equipment and vehicles, and Caltrain transit through Sunnyvale. In 2008, the total baseline GHG emissions were 1,270,170 MTCO₂e. Commercial/Industrial was the largest sector (39%), followed closely by transportation (35%), and then residential (16%), community waste (6%), and off-road (3%). The remainder of the emissions from water, landfill gas, and Caltrain are a combined 3% of the total emissions (PMC 2011).

3.6.4 Impact Analysis

Criteria for Determining Significance

For the purposes of this analysis, the Proposed Project would result in a significant impact related to GHG emissions if it would:

- a) Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or
- b) Conflict with an applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the emission of GHGs.

Significance Thresholds

As discussed in the "Regulatory Setting" section, above, BAAQMD did not recommend numeric GHG thresholds applicable to construction-related GHG emissions. Since no

numeric thresholds are available for construction emissions, for this GHG analysis the District compares Project construction emissions to the operational-related bright-line mass emission GHG threshold amortized over the life of the project assumed to be 30 years. For land-use development projects, including residential, commercial, industrial, and public land uses and facilities; the threshold is annual emissions of less than 1,100 MTCO_{2e}. Thus the threshold for construction would be if amortized GHG emissions are less than 1,100 MTCO_{2e}. Since the impact of GHG emissions are a cumulative problem, they are only evaluated for their contribution to the cumulative impact.

Methodology

This EIR does not evaluate Project maintenance activities, which are described and analyzed under the District's Stream Maintenance Program Subsequent EIR (refer to Chapter 2.0, "Project Description").

Emissions Calculations

Emissions of GHGs from the construction of the Proposed Project were estimated using the Road Construction Emissions Model (Model) (Version 7.1.3, developed by the Sacramento Metropolitan Air Quality Management District). The Model estimates emissions from construction activities that would take place for the Proposed Project, including excavation, grading, paving, soil hauling, and the use of off-road equipment. Two model scenarios were developed and described in Section 3.2, Air Quality. The emissions calculations were performed by grouping construction crews together. However, because each crew type would work for different total lengths of work durations but overlap in time (10 months over 2 years for in-stream crews compared to 14 months over 2 years for out-of-channel work crews), two different construction duration scenarios were simulated. The 14-month scenario represents a reasonable value if all construction were to occur over a total duration of 14 months. The 10-month scenario represents the conservative assumption that all work would be completed in 10 months. Use of the Model to estimate emissions from Project construction activities, including assumptions used, is discussed in the "Methodology" section in Chapter 3.2.

In addition to the combustion of CO₂ from construction, the GHGs CH₄ and N₂O are also emitted during the combustion of fossil fuels from mobile sources. Emissions of CH₄ and N₂O are usually a relatively small proportion of overall transportation-related GHG emissions, about 2–5% combined (EPA 2008). As such, CO₂ emissions from each phase of the project were augmented by 5% to obtain the total emissions from CH₄ and N₂O (given as CO_{2e}).

Annual average GHG emissions estimated from Project construction activities are summarized in **Table 3.6-1**.

Table 3.6-1. Estimated Average Annual Emissions during Project Construction

Emissions Source by Construction Crew / Emissions Threshold	Average Annual Emissions (metric tons)			Amortized Emissions (metric tons)
	CO ₂	CH ₄ , N ₂ O (as CO ₂ e)	Total (CO ₂ e)	CO ₂ e
All Construction Crews (10-month duration)	1,533.6	76.7	1,610.3	53.7
All Construction Crews (14-month duration)	1,671.9	83.6	1,755.5	58.5

Environmental Impacts

The impact discussions below are structured as follows: First, the environmental impacts of the Proposed Project in the absence of best management practices (BMPs) are discussed. The discussion then presents applicable District BMPs that would avoid or minimize the level of impact. A conclusion regarding the significance of the environmental impact is then made (considering implementation of the District BMPs, as applicable). If the impact would be significant even with use of BMPs, MMs are prescribed. The residual significance of each impact following application of the MMs is then provided.

Impact GHG-1: Temporary Increase in GHG Emissions from Project Construction Activities – Less than Significant

Project construction activities would require daily use of construction equipment and vehicles powered by diesel and gasoline fuel, the combustion of which would emit GHGs. These emissions will be temporary and will cease once the Proposed Project construction is completed.

Project Construction Emissions

Emissions estimates of GHGs, specifically CO₂, CH₄ and N₂O, from Project construction are shown above in Table 3.6-1. As shown in this table, amortized GHG emissions of construction emissions are between 53.7 and 58.5 MTCO₂e are estimated from Project construction activities. Amortized GHG emissions from Project construction activities are estimated to be well below the CARB threshold of 7,000 MTCO₂e per year, and below the BAAQMD's 2010 land-use operational threshold of 1,100 MTCO₂e per year.

Applicable Best Management Practices

No District BMPs are applicable to this impact.

Conclusion

There are no numeric thresholds applicable to the Project's construction-related GHG emissions. However, amortized GHG emissions from Project construction are estimated to be below CARB's numeric GHG threshold for operation of industrial facilities and the BAAQMD's numeric 2010 Threshold for land use operations. Therefore, this impact is considered less than significant.

Impact GHG-2: Conflict with an Applicable Plan, Policy or Regulation of an Agency Adopted for the Purpose of Reducing GHG Emissions from Project Construction Activities – Less than Significant

Project construction activities would require daily use of construction equipment and vehicles powered by diesel and gasoline fuel, the combustion of which would emit GHGs. In accordance with State law and the City of Sunnyvale CAP, the Proposed Project construction vehicles would be limited to idling for 3 minutes or less to minimize emissions.

Applicable Best Management Practices

No District BMPs are applicable to this impact.

Conclusion

The state has implemented AB 32 to reduce GHG emissions as well. The project does not pose any conflict with the most recent list of CARB's early action strategies nor is it considered as one of the sectors at which measures are targeted. The project is not one that would be required to report emissions to CARB. Therefore the specific emissions from this project would not be expected to have a substantial impact on Global Climate Change. The District will be consistent with the measures outlined in the City of Sunnyvale CAP by implementing idling limits. There does not appear to be any conflict with AB 32 and the City of Sunnyvale CAP. Therefore, this impact is considered less than significant.

Hazards and Hazardous Materials

3.7.1 Introduction

This chapter summarizes the potential hazards and hazardous materials impacts related to the Proposed Project. This section presents an overview of hazards and hazardous materials in the Project Area, including contaminated soil and groundwater, and evaluates Project construction-related impacts, including releases of hazardous materials and interference with an adopted emergency response plan or emergency evacuation plan. Where feasible, mitigation measures are identified to reduce the level of expected impacts.

Data sources used in the preparation of this chapter include:

- California Department of Forestry and Fire Protection's fire hazard maps,
- State Water Resources Control Board's (SWRCB's) GeoTracker,
- California Department of Toxic Substances Control's (DTSC's) EnviroStor database, and
- Phase I Environmental Site Assessment of the Sunnyvale Channels previously prepared for the District (TRC 2007).

3.7.2 Regulatory Setting

Federal Regulations

Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also called the Superfund Act; 42 U.S. Government Code [USC] Section 9601 et seq.) is intended to protect the public and the environment from the effects of prior hazardous waste disposal and new hazardous material spills. Under CERCLA, the U.S. Environmental Protection Agency (EPA) has the authority to seek the parties responsible for hazardous materials releases and to assure their cooperation in site remediation. CERCLA also provides federal funding (the "Superfund") for the remediation of hazardous materials contamination. The Superfund Amendments and Reauthorization Act of 1986 (Public Law 99-499) amends some provisions of CERCLA and provides for a Community Right-to-Know program.

Moffett Field is adjacent to the Project Area. It has been identified as a Superfund site owing to the extent of soil and groundwater contamination from petroleum products and volatile organic compounds (VOCs), such as trichloroethene (TCE) and tetrachloroethene or perchloroethene (PCE). Sediments are contaminated in wetland areas of the base, primarily in outfall areas. The prime contaminants in the sediments are polychlorinated biphenyls (PCBs) and pesticides. In all, 30 hazardous waste sites have been identified on the site. Ongoing work is being conducted at eight of these sites. Additionally, Moffett Field's underlying groundwater is contaminated by past activities. Consequently, groundwater cleanup standards have been established. Groundwater in the underlying aquifers beneath Moffett Field is not currently used for potable water uses; however, it is a potential future source of drinking water (EPA 2013).

State Regulations

California Occupational Safety and Health Administration Standards

Worker exposure to contaminated soils and vapors that could be inhaled, or possibly groundwater containing hazardous levels of constituents, is subject to monitoring and personal safety equipment requirements that are established in California Occupational Safety and Health Administration (Cal/OSHA) regulations (Title 8) and specifically address airborne contaminants. Workers who are in direct contact with soil or groundwater containing hazardous levels of constituents are required to perform all activities in accordance with a hazardous operations site-specific health and safety plan, as outlined in Cal/OSHA standards. The primary intent of the Title 8 requirements is to protect workers, but compliance with some of these regulations also results in reducing potential hazards to non-construction workers and local residents as a result of site monitoring and reporting requirements and other controls.

Local Regulations

Santa Clara County Hazardous Materials Program

The Santa Clara County Hazardous Materials Compliance Division (HMCD) was established in 1983 with the adoption of the local Hazardous Materials Storage Ordinance, which regulates the storage of hazardous materials both above and below ground. This ordinance, the first of its kind in the state, has several key provisions that when implemented by businesses provide protection of public health and the environment. In addition to the Hazardous Materials Storage Ordinance, HMCD enforces the County's Toxic Gas Ordinance and Non-Point Source Ordinance.

Passage of Senate Bill 1082 in 1993 required consolidation of the following state-mandated hazardous waste and hazardous materials management programs within a single Unified Program, administered by a Certified Unified Program Agency (CUPA):

- Hazardous Waste Generator and Tiered Permitting

- Aboveground Storage Tanks
- Underground Storage Tanks
- Hazardous Materials Release Response Plans and Inventories
- California Accidental Release Program
- Hazardous Materials Management Plans and Inventories

HMCD has been certified by the state to administer these six programs throughout Santa Clara County, except in the cities of Santa Clara, Gilroy, and Sunnyvale, which are independent CUPAs themselves. It is the responsibility of each CUPA to consolidate administration of the six programs by consolidating permits and billing of permit fees, and developing a single inspection and enforcement program.

Sunnyvale Hazardous Materials Compliance Unit

The Sunnyvale Department of Public Safety, Hazardous Materials Compliance Unit (HMCU) is the CUPA for the City of Sunnyvale (City of Sunnyvale 2012a). The focus of the program is the prevention of hazardous materials discharges that may adversely affect community safety or the environment. Local ordinances, state codes, and regulations provide the authority and direction for this permitting and inspection program.

As a CUPA, the HMCU is responsible for the implementation of the following environmental program elements:

- Hazardous Materials Business Plan Program
- Hazardous Waste Generator Program
- Hazardous Waste Tiered Permitting Program
- Aboveground Storage Tank Program
- Underground Storage Tank Program
- California Accidental Release Prevention Program

In addition, the HMCU enforces the California Integrated Waste Management Board requirements, such as the Waste Tire Management Program. The HMCU also enforces local ordinances regulating hazardous materials storage (Sunnyvale Municipal Code [SMC] Title 20, Chapter 20) and the safe use and storage of toxic gases (SMC Title 16, Chapter 16.53).

City of Sunnyvale General Plan

The *Sunnyvale General Plan* Safety and Noise element ensures that hazards, including seismic, flood, fire, hazardous materials, and aviation hazards, are considered in City of Sunnyvale's (City's) planning process. The following policy contained in the City's General Plan (City of Sunnyvale 2011) is relevant to the Proposed Project.

Safety and Noise – Hazards and Disaster Preparedness and Response

Policy SN-1.5 Promote a living and working environment safe from exposure to hazardous materials.

3.7.3 Environmental Setting

This section describes the existing conditions of the Project Area with respect to hazards and hazardous materials. It identifies areas potentially affected by known hazardous materials in soil or groundwater, as well as by wildfire hazards.

Hazardous Materials in the Project Vicinity

Soil and Groundwater Contamination

Under federal and state laws, any material, including wastes, may be considered hazardous if specifically listed by statute as such or if it causes adverse human health effects, has the ability to burn, causes severe burns or damage to materials, causes explosions, or generates toxic gases. Past industrial or commercial activities on a site could have spilled or leaked hazardous materials into the ground. Disturbance of subsurface soil during construction can lead to exposure of workers or the public from stockpiling, handling, or transportation of contaminated soils.

The Project Area and surrounding lands were predominantly agricultural before construction of the Sunnyvale Channels in the late 1950s and 1960s. Both channels were constructed of compacted earthen fill. Past agricultural land use practices are believed to be the source for residual traces of chlorinated pesticides, such as DDT, in the channel levees and surrounding areas. Studies of water and sediment in other channels in the Project Area (besides the Sunnyvale Channels) have detected contaminants including pesticides, PCBs, metals, and polynuclear aromatic hydrocarbons (PAHs) (TRC 2007). Therefore, it is reasonable to conclude that similar contaminants, at similar concentrations, may also be present in levee/channel bank soil and sediment within the Project Area.

The following section provides a discussion of known contaminated sites in the Project Area. Additional details of historic and current hazardous materials known to occur in the Project vicinity are included in the Environmental Site Assessment prepared for the Sunnyvale Channels (TRC 2007) and provided as **Appendix I**). Additionally, a discussion of detected contaminants in Pond A4, and the adjacent Moffett Channel and Guadalupe Slough, is provided in Section 3.8, "Hydrology, Geomorphology, and Water Quality."

Hazardous Waste Generating Sites

Numerous hazardous materials are present in the city of Sunnyvale. Generally, the number of hazardous waste generators has increased over time and the types of generators have changed from primarily manufacturing industries to primarily service-type businesses and industries (e.g., dry cleaners and auto repair shops). Current business and industry generators in the Project Area include automotive and transportation industries, which store and use petroleum fuels, chlorinated solvents, and paints for repairs, and manufacturing industries that use solvents, paints, metals, compressed gases, and cleaning agents.

The Sunnyvale Materials Recovery and Transfer (SMaRT) Station is located between Caribbean Drive and Pond A4 and between the East and West Channels. This facility is adjacent to the former Sunnyvale Landfill and accepts items from the public for recycling, composting, or disposal. Hazardous waste-containing items, such as batteries, motor oil, and mercury thermometers, are accepted at the SMaRT Station. Items that cannot be recycled are transferred to a permitted hazardous waste facility. The facility is operated according to waste handling regulations issued by the state. Though hazardous materials are present on-site, measures are in place to prevent impacts on people and the surrounding environment.

The Sunnyvale Landfill was closed in 1993. Methane generated by the landfill is collected and powers water treatment activities at the City's Water Pollution Control Plant (WPCP) adjacent to the SMaRT facility and the West Channel near Pond A4. While the landfill does contain contaminated materials, monitoring suggests that the contamination is contained within the landfill and is not influencing soil or groundwater quality in the area surrounding the site (TRC 2007).

Several research and development facilities, electronic component manufacturing businesses, and similar types of technology businesses are located in the commercial region of the Project Area, between San Francisco Bay and the Central Expressway. Many of these businesses use and store hazardous materials and are regulated by either the Santa Clara County Hazardous Materials Program or Sunnyvale Hazardous Materials Compliance Unit. Several spills of hazardous materials from facilities in the Project Area have been reported over the years (see descriptions below).

Brownfields

Brownfields are properties that have a potential for redevelopment or reuse, but owing to actual or suspected contamination, are vacant. Former auto-wrecking yards, gas stations, and manufacturing sites with chlorinated solvent discharges are examples of brownfields. Brownfield sites are regulated by the SWRCB and the Regional Water Quality Control Boards (RWQCBs), in partnership with DTSC. DTSC identifies sites that have known contamination and sites that may require further investigation, and maintains EnviroStor, an online database of Federal Superfund sites, State Superfund sites, voluntary cleanups, and school sites. A number of contaminated sites and

brownfields exist within the city of Sunnyvale; however, there are no active cleanup investigations being led by federal agencies within 1,000 feet of the Project Area (DTSC 2012a).

Known Historic Hazardous Materials Spill Sites

A detailed discussion of sites with a known history of hazardous material spills and releases in the Project vicinity was conducted in 2007 (TRC 2007) (refer to Appendix I). Past sites of soil and groundwater contamination within the Project vicinity are identified below and shown in **Figure 3.7-1**:

- Moffett Federal Air Field (Moffett Field) (a Superfund site);
- City of Sunnyvale Landfill and WPCP, 301 Carl Road;
- A.C. Ball Company, 141 Caspian Court;
- Lockheed Martin, 1111 Lockheed Way;
- 645/675 Almanor Avenue Et Al, 645/675 Almanor Avenue;
- Litton Applied Technology, 525 Almanor Avenue;
- Ventritix Intersil, 610 North Pastoria Avenue; Siemens Microelectronics, Inc., 639 North Pastoria Avenue;
- Advanced Micro Devices, 915 DeGuigne Drive;
- T-M Manufacturing, 695 East Arques Avenue;
- Phillips Semiconductor, 811 East Arques Avenue;
- Signetics Corporation/Philips Semiconductor, 740 Kifer Road;
- Moffett Channel; and
- Pond A4.

Many of the sites listed above have been remediated and closed; however, it is possible that containments remain in the soil and groundwater in some of these locations. According to EnviroStor, some of these sites are currently undergoing evaluation of the contamination and remediation options (DTSC 2012a). Such contaminants as PCBs, metals, and PAHs, are expected to be at their highest concentrations in the northern portions of the channels where there is commercial development. Several of the sites listed above, primarily electronic manufacturing plants, are areas where spill incidents involving VOCs have been reported.

In general, widespread soil and groundwater contamination appears to be present in the area between U.S. Highway (Hwy) 101 and State Route (SR) 82, specifically from TCE, which is an industrial solvent used in manufacturing of electronics. Spills, Leaks, Investigations, and Cleanup (SLIC) sites in the Project vicinity are managed by the San Francisco Bay RWQCB. SLIC sites are listed in the state's GeoTracker database

(SWRCB 2012). Additionally, pesticides may be present along the entire length of the Sunnyvale Channels because the land was historically used for agricultural purposes.

Underground Storage Tanks and Other Hazardous Spills

Underground storage tanks are commonly used for the storage of gasoline and diesel fuels. They are also used for the storage of new and used motor oil, solvents, chemicals, etc. Numerous permitted underground storage tanks are found in the Project vicinity, with more storage tanks occurring along the West Channel than the East Channel. However, no tanks are located within the District’s right-of-way for the Sunnyvale Channels or properties that would be acquired as part of the Project. Leaking underground fuel tanks (LUFTs), mainly those containing fuel, are the leading cause of soil and groundwater contamination in Santa Clara County and primarily occur in urbanized areas. Contaminated LUFT sites are tracked in SWRCB’s GeoTracker database (which can be accessed at: <http://geotracker.waterboards.ca.gov>). According to GeoTracker, 12 open LUFT sites exist within the city of Sunnyvale (SWRCB 2012). Open, active LUFT sites within 1,000 feet of the Sunnyvale Channels are summarized in **Table 3.7-1** and shown on Figure 3.7-1.

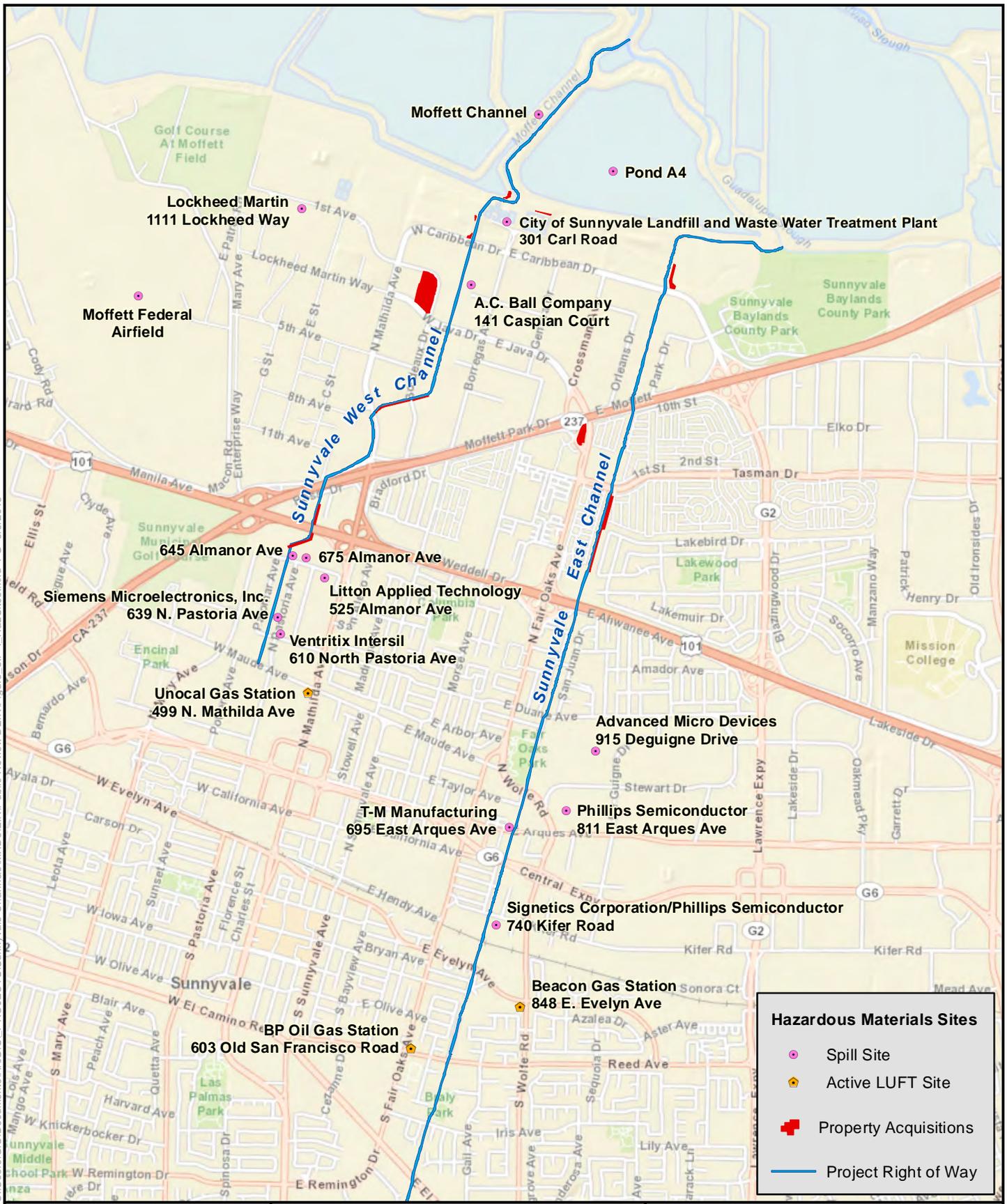
Table 3.7-1. Active LUFT Sites within 1,000 feet of the Sunnyvale Channels

LUFT Site & Location	Site Description	Cleanup Information
Sunnyvale West Channel		
Unocal Gas Station 499 N. Mathilda Avenue, on the corner of W. Maude Avenue	Leaking fuel tanks removed in 1989. Soil and shallow groundwater have been treated. However, groundwater continues to contain detectable petroleum hydrocarbons down to 100 feet below the surface.	<ul style="list-style-type: none"> - Lead Site Cleanup Oversight: Santa Clara County, with support from the RWQCB. - GeoTracker #4315 (T0608501529)
Sunnyvale East Channel		
Beacon Gas Station 848 E. Evelyn Avenue, on the corner of S. Wolfe Road	Contaminated groundwater was detected in 1984. Extraction of fuel contamination in shallow groundwater surrounding the site is ongoing.	<ul style="list-style-type: none"> - Lead Site Cleanup Oversight: Santa Clara County, with support from the RWQCB. - GeoTracker #543 (T0608500228)
BP Oil Gas Station 603 Old San Francisco Road, on the corner of S. Fair Oaks Avenue	Leaking fuel tanks were replaced in 1985. Contaminated shallow groundwater continues to be treated in the vicinity of the site.	<ul style="list-style-type: none"> - Lead Site Cleanup Oversight: Santa Clara County, with support from the RWQCB. - GeoTracker #11232 (T0608500938)

Source: SWRCB 2012.

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Hazardous Materials Sites

- Spill Site
- ⬮ Active LUFT Site
- + Property Acquisitions
- Project Right of Way



Sources: SCVWD 2012; ESRI

Prepared for:
Santa Clara Valley Water District
October 2013

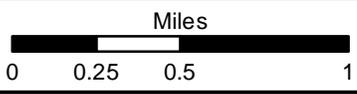


Figure 3.7-1
Existing Hazardous Materials Sites in the Project Area

Sunnyvale East and West Channel Flood Protection Project

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Hazardous Waste Disposal Sites

Although hazardous waste collections facilities are located in Santa Clara County (e.g., the SMaRT Station in Sunnyvale), there are no certified hazardous waste disposal facilities in the County (DTSC 2012b). Thus, excavated soil with hazardous levels of contaminants, or any other materials meeting the criteria as hazardous waste, would need to be disposed of at a permitted hazardous waste facility outside of the County. California contains three hazardous waste disposal facilities: Chemical Waste Management Inc.'s facility in Kettleman City (Kettleman City), Clean Harbors Buttonwillow (Buttonwillow), and Clean Harbors Westmorland (Westmorland) facilities. These facilities are capable of treating, storing, and/or disposing of virtually all solid, semi-solid, and liquid hazardous, extremely hazardous, and non-hazardous wastes, including contaminated sediments. The choice of facility for disposal depends on the characteristics of the material to be disposed of, the current available capacity at the facility, and the transportation distance. In particular, any soil excavated as part of Project activities that is classified as hazardous would likely be disposed of at the Kettleman City facility, as it is the closest facility to the Project Area. The next closest facility is Buttonwillow.

Transportation Routes

Hazardous wastes are transported by truck, primarily along the major arterials and highways. County roads and city streets may be used to transport hazardous wastes from their sources to major highways. Haulers are required to use the most direct, safe route to and from disposal facilities.

Emergency Response

Hazardous materials emergency response is the responsibility of the City of Sunnyvale's Department of Public Safety, Fire Services Bureau (City of Sunnyvale 2012b). The Fire Services Bureau provides emergency medical services, fire suppression, hazardous material incident mitigation, rescue operations, confined space rescue operations, fire prevention/investigations, and statewide mutual aid response. The Fire Services Bureau operates from six stations located throughout the city. The nearest fire station to the Project Area is located at 700 All America Way in Sunnyvale.

The Hazardous Materials Compliance Unit of the City's Department of Public Safety implements the following programs within the city limits: Hazardous Materials Business Plan Program, Hazardous Waste Generator Program, Hazardous Waste Tiered Permitting Program, Aboveground Storage Tank Program, Underground Storage Tank Program, and California Accidental Release Prevention Program.

Wildland Fire Hazards

The primary fire season in the Project Area extends from late summer through fall, when conditions are driest and air temperatures are high. Fire hazards in Santa Clara County are influenced by topography and wind patterns. However, the Project Area is not located within a designated fire hazard area or within the wildland urban interface (County of Santa Clara Office of the Fire Marshall 2012).

Nearby Schools

Nine schools are located within approximately a 0.25 mile of the Project Area. **Table 3.7-2** lists these schools, their location, and the approximate number of students attending the facility.

Table 3.7-2. Schools within Approximately a Quarter Mile of the Project Area

School Name	Address	Students
Louse E. Stockmeir Elementary	592 Dunholme Way	1,093
The King's Academy	562 North Britton Avenue	905
Ellis Elementary	550 East Olive Avenue	729
Lakewood Elementary	750 Lakechime Drive	488
San Miguel Elementary	777 San Miguel Avenue	432
Rainbow Montessori	790 E. Duane Avenue	406
Braly Elementary	675 Gail Avenue	398
Saint Martin Elementary	597 Central Avenue	197
Children's Creative Learning Center	794 E. Duane Avenue	n/a

Sources: NCES 2013; The King's Academy 2012.

3.7.4 Impact Analysis

Criteria for Determining Significance

For the purposes of this analysis, the Proposed Project would result in a significant impact if it would:

- a) Create a significant hazard to the public or the environment through the routine transport, use, storage or disposal of hazardous materials, or through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- b) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school;
- c) Create a significant hazard to the public or the environment from existing hazardous material contamination on site or nearby;
- d) For a project located within 2 miles of an airport or in the vicinity of a private airstrip, would the project result in a substantial safety hazard for people residing or working in the project area or to aircraft utilizing the airport?
- e) Impair implementation of an adopted emergency response plan; and
- f) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands

Topics Dismissed in the Initial Study Checklist

The Initial Study Checklist (IS) dismissed potential impacts from hazards in the vicinity of a public or private airstrip from further analysis because Project activities would not affect public or private airstrips located near the Project Site. The IS dismissed potential impacts on adopted emergency response plans from further analysis because no Project activities have the potential to affect local programs and services related to emergency response plans. The IS dismissed impacts related to exposure of people or structures to risk of wildland fires from further analysis because the Project Area is not located in a fire hazard area or within the wildland-urban interface. Refer to the introduction to Chapter 2, Section 3.0.2 for additional detail regarding these criteria.

Methodology

Impacts of the Proposed Project were evaluated qualitatively, based on the potential for Project construction to create a significant hazard with regard to the public or environment. After the Project is constructed, ongoing Project maintenance would occur as needed. Potential hazard-related impacts associated with the post-Project maintenance of the Sunnyvale channels is addressed by the District's Stream Maintenance Program Subsequent EIR (refer to Chapter 2.0, "Project Description") and is not addressed in this EIR. The Stream Maintenance Program Subsequent EIR is available for review online: <http://valleywater.org/SMPSEIR2011.aspx>. See Volume 2, Chapter 3, Section 3.6 for the Hazards and Hazardous Materials impact discussion.

Environmental Impacts

Impacts related to public and environmental exposure to, and release of, hazardous materials are evaluated in this section. Potential impacts specific to water quality, are discussed in Chapter 3.8, "Hydrology, Geomorphology and Water Quality."

The impact discussions below are structured as follows. First, the environmental impacts of the Proposed Project in the absence of best management practices (BMPs) are discussed. The discussion then presents applicable District BMPs that would avoid or minimize the level of impact. A conclusion regarding the significance of the environmental impact is then made (considering implementation of the District BMPs, as applicable). If the impact would be significant even with use of BMPs, mitigation measures (MMs) are prescribed. The residual significance of each impact following application of the MMs is then provided.

Impact HM-1: Potential Release of Existing Contaminated Soil and Groundwater Discovered during Project Construction Activities and Resulting Exposure to Construction Workers, the Public, or the Environment – Less than Significant with Mitigation

An Environmental Site Assessment prepared for the Sunnyvale Channels (described above) revealed a variety of known (historic and current) hazardous materials contamination sites within the city of Sunnyvale and surrounding areas, including residual traces of chlorinated pesticides in other channel levees and surrounding areas; detection of pesticides, PCBs, metals, and PAHs within water and sediment in the Cargill Channel (west of the West Channel) and drainage ditches associated with the Cargill Channel and Moffett Channel; known incidents where spills involving VOCs have been reported; and generally widespread soil and groundwater contamination from TCE in the area between Hwy 101 and SR 82 (TRC 2007). Additionally, three open, active LUFTs are known to be located within 1,000 feet of the Sunnyvale Channels (SWRCB 2012).

To date, no existing hazardous materials contamination has been identified directly within the Project Work Area, as shown in Figure 3.7-1. However, a VOC spill remediation site located at 141 Caspian Court, adjacent to the West Channel and upstream (south of) Caribbean Drive, is known to have contributed to contaminated shallow groundwater in this area. The City's landfill is also known to contain some VOC-affected groundwater (SCVWD 2013). Owing to the presence of historic and existing hazardous materials sites in the Project vicinity, it is considered possible that contaminated soil and groundwater from this and other known sites could occur within the Project Work Area. Additionally, other undiscovered sites of contaminated soil and groundwater could exist in the Project Work Area.

Similar contaminants to those known in in the Project vicinity may also be present in levee/maintenance roads and other channel soil and sediment, and in groundwater. While prior testing from samples taken in the northern portion of the channels and Pond A4 resulted in contaminant concentrations that are low compared with hazardous waste criteria and human health screening levels (TRC 2007), there is the potential that previously undiscovered contamination in the Project Work Area could occur at concentrations harmful to human health.

Contaminated Groundwater

As discussed in Impact HYD/WQ-5 in Chapter 3.8, "Hydrology, Geomorphology and Water Quality," contaminated groundwater could be encountered during excavation activities requiring dewatering of the Sunnyvale Channel reaches. The extent of exposure to persons or the environment would depend on the nature and extent of any contaminated groundwater discovered, as well as the manner by which groundwater is handled and discharged, such as in a tank or through a pipeline. Since dewatering involves installing and maintaining equipment in the water, such as pumps and connecting pipes, construction workers would come in direct contact with potentially contaminated groundwater. Therefore, the potential for human exposure to contaminated groundwater is potentially high. Significant adverse effects on humans or the environment could result if proper precautions are not taken.

Contaminated Soil

Excavation Activities

Excavation from channel easements for floodwalls or in-channel excavation of sediment for rock slope protection and sediment removal could expose or disturb existing contaminated soil previously unknown within the Project Work Area. Project excavation activities would typically be rather shallow. Excavation from channel easements (adjacent to the top of channel bank) would typically occur to a depth of 6.5 feet and excavation from inside the channel (bed and banks) would occur to a depth of 2.5 feet. However, if anchored floodwalls are installed, excavation from channel easements could extend to a depth of 18.5 feet at these locations. While the use of anchored floodwalls would be limited, the exact possible locations of this component have not yet been

determined. Project excavation activities have the potential to encounter previously undiscovered existing contaminated soil located beneath the ground surface, even at shallow depths.

Furthermore, the District intends to reuse soil and sediment excavated from channel easements for installation of floodwalls, to the extent possible. For sediment excavated directly from the channel, only a small amount would be reused for filling of gaps between rocks installed in the channels for slope protection. Soil that isn't reused for other activities would be transported off-site and legally disposed. This sediment would not be reused for other purposes.

If hazardous materials are present in excavated soil, a release into the environment could occur in the immediate vicinity of construction workers, in proximity to the public, and/or near or directly to surrounding environmental resources (e.g., biological or water resources). Release of hazardous materials could occur if contaminated soil is directly discharged to land or the water of the Sunnyvale Channels, if chemical vapors are emitted, or if exposed soil comes into contact with surface runoff or is blown off site by the wind. The extent of exposure to persons or the environment would depend on the nature and extent of any contaminated soil discovered, as well as the manner by which soil is being used for construction. Since excavation involves removing large amounts of soil and transporting the soil around, or out of, the Project Work Area, the potential for exposure from any discovered contaminated soil is potentially high during excavation. Significant adverse effects on humans or the environment could result if proper precautions are not taken.

Grading Activities

Construction grading activities, such as regrading maintenance roads, would disturb the top layer of the existing ground surface. Grading would also occur in channel easements for levee modifications. Grading of the existing ground surface could disturb existing undiscovered contaminated soil. Since grading would be limited to moving soil around the ground surface and no soil would be transported around or out of the Project Work Area, the potential for exposure is considered to be much less than from excavation activities. However, since exposure is possible significant adverse effects on humans or the environment could result if proper precautions are not taken during grading activities.

Other Construction Activities

It is expected that Project construction activities other than excavation and grading do not have the potential to result in the release of contaminated soil or sediment because these activities would not disturb the existing ground surface, other than from the placement and manipulation of new material. These activities include paving, rock installation, road resurfacing, bridge/headwall demolition, and concrete forming and installation. This impact is considered less than significant.

Applicable Best Management Practices

The District would implement best management practices (BMPs) HM-12 and HM-15 to reduce potential exposure from encountering existing contaminated soil during the construction activities described above by requiring personnel training and emergency response procedures and by requiring personal protective equipment for workers. The District would also implement BMPs WQ-11, WQ-12, WQ-15, and WQ-16, which require in-channel work sites to be dewatered before construction begins in the channel. The full text of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP HM-12: Assure Proper Hazardous Materials Management

BMP HM-15: Avoid Exposing Soils with High Mercury Levels

BMP WQ-11: Use Cofferdams for Tidal Work Areas

BMP WQ-12: Divert/Bypass Water at Non-tidal Sites

BMP WQ-15: Manage Groundwater at Work Sites

BMP WQ-16: Avoid Erosion When Restoring Flows

Conclusion

BMPs WQ-11, WQ-12, WQ-15, and WQ-16 require in-channel work sites to be dewatered before construction begins in the channel. Implementation of BMPs HM-12 and HM-15 would reduce potential exposure to contaminated soils. Even with implementation of these BMPs, there is a chance that contaminated soil and/or groundwater discovered during construction activities could be mishandled, resulting in exposure to people or release to the environment. Therefore, this impact is considered potentially significant. The District would implement the following mitigation measure (MM) to manage the potential for exposure from discovered contaminated soil and groundwater.

Mitigation Measure HM-1: Conduct a Phase I and Phase II Environmental Site Assessments and Implement Site Remediation Actions Prior to Construction.

Prior to excavation activities, the District will ensure that a qualified contractor conducts a Phase I and Phase II Environmental Site Assessment (ESA) at excavation sites along the entirety of the West Channel and at excavation sites along the portion of the East Channel between East Evelyn Ave and 101 in accordance with ASTM Standard E1527 – 05 (Phase I ESA) and ASTM Standard E 1903-11 (Phase II ESA), and the EPA's All Appropriate Inquiries (AAI) Rule 2005-11-01 (EPA 40 CFR Part 312). Phase I and II ESAs generally expire after one year.

The objective of the Phase I ESA will be to identify recognized environmental conditions (RECs), as defined by the ASTM Standard. The object of the Phase I

ESA is also to satisfy Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) AAI requirements. The ESA will identify obvious areas of significant environmental concern through a review of the site history, a review of the regulatory agency database information, the performance of a site reconnaissance, and the evaluation of potential impacts from adjacent properties. The findings of the Phase I will inform the Phase II ESA. Considering that the Phase I ESA completed in 2008 recommended completion of a Phase II ESA, a Phase II ESA will likely be recommended in the more recent Phase I ESA.

The Phase II ESA will assess the presence of hazardous substances at the site by conducting tests of soil and water in the Project Area. Tests will evaluate concentrations pollutants, contaminants, petroleum and petroleum products, and human and ecological toxicity. If the conclusions of the Phase II ESA indicate that hazardous substances are not present in excavation areas and remediation of soil and groundwater is unnecessary to protect human health and the environment, all obligations of this mitigation will have been met.

If the conclusion of the Phase II ESA indicate that soil or groundwater remediation are necessary to protect human health and the environment, the District will enter into a voluntary Remedial Action Agreement with the Santa Clara County Department of Public Health to ensure proper site remediation and soil and water handling procedures prior to conducting excavation or dewatering activities. The County, as the local oversight agency for the State Water Resources Control Board, will provide oversight and review of the Phase I and II ESAs and direct the District on site remediation actions.

With implementation of MM HM-1, the District would identify areas of contamination where construction excavation would occur and implement measures to ensure the safety of the public and environment. With the implementation of this mitigation measure, this impact would be reduced to a less-than-significant level.

Impact HM-2: Creation of Hazards Potentially Affecting the Public or the Environment from the Use of Oil, Gasoline, or Other Hazardous Materials during Construction Activities – Less than Significant

During Project construction, hazardous materials, such as oils, fuels, or other petroleum products, as well as hazardous materials commonly used with construction equipment, may be temporarily used to power construction equipment or perform construction activities. No hazardous materials would be applied directly to the ground surface for the Project. Impacts could occur if these hazardous materials were released into the environment from improper transport, use, or disposal. Accidental release of hazardous materials could degrade soil, groundwater, and/or surface water quality in nearby creeks or downstream water bodies.

Applicable Best Management Practices

The District would implement BMPs HM-9 through HM-14 to reduce potential discharge or accidental spill of hazardous materials associated with use of construction equipment. BMP HM-9 requires vehicles to be washed only at the corporation yard; HM-10 requires proper containment and location of vehicle and equipment fueling; HM-11 requires servicing equipment in an appropriate manner; HM-12 requires training of personnel to properly respond to hazardous materials incidents; HM-13 requires training of personnel to avoid spills of hazardous materials; and HM-14 requires the provision of spill prevention kits. The full text of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP HM-9: Clean Vehicles and Equipment

BMP HM-10 Assure Proper Vehicle and Equipment Fueling

BMP HM-11 Assure Proper Vehicle and Equipment Maintenance

BMP HM-12 Assure Proper Hazardous Materials Management

BMP HM-13 Prevent Spills

BMP HM-14 Know the Spill Kit Location

Conclusion

As discussed above in Section 3.7.2, "Regulatory Setting," numerous laws and regulations apply to the storage of hazardous materials to minimize the potential for improper handling, spills, and releases. Compliance with these laws and regulations would ensure proper handling, storage, transport, and disposal of hazardous materials and hazardous wastes, which would minimize the potential for an accidental release. Furthermore, the implementation of the District's BMPs HM-9 through HM-15, which provide guidance on vehicle and equipment fueling and maintenance, hazardous materials management, spill prevention, and spill response, would minimize the potential for releases during construction. With the implementation of these BMPs during Project construction, this impact is considered less than significant.

Impact HM-3: Emission or Handling of Hazardous Materials in Proximity to Schools – Less than Significant with Mitigation

As listed in Table 3.7-2, nine schools are within approximately a 0.25 mile of the Project Area and one school, the King's Academy, is directly adjacent to the Project Area. Construction activities would typically occur between May 1st through about November 1st. Construction work would coincide with school days for up to 3 or 4 months of the school year. However, construction at any one particular area of the Sunnyvale Channels would last for a much shorter period of time.

Construction activities would be temporary and the type of construction would not create significant hazardous emissions. During construction, hazardous materials commonly associated with construction equipment would be used in proximity to schools. Additionally, as discussed in Impact HM-1, unknown contaminated soil could be discovered during Project construction activities. Exposure and release of contaminated soil within the Project Work Area could occur in proximity to schools if wind-blown contaminated dust particles or contaminated runoff were to reach the school site.

Applicable Best Management Practices

The District would implement BMPs HM-9 through HM-14 to reduce potential discharge or accidental spill of hazardous materials associated with use of construction equipment. BMP HM-9 requires vehicles to be washed only at the corporation yard; HM-10 requires proper containment and location of vehicle and equipment fueling; HM-11 requires servicing equipment in an appropriate manner; HM-12 requires training of personnel to properly respond to hazardous materials incidents; HM-13 requires training of personnel to avoid spills of hazardous materials; and HM-14 requires the provision of spill prevention kits. The full text of each BMP is provided in Chapter 2, "Project Description."

BMP HM-9: Clean Vehicles and Equipment

BMP HM-10: Assure Proper Vehicle and Equipment Fueling

BMP HM-11: Assure Proper Vehicle and Equipment Maintenance

BMP HM-12: Assure Proper Hazardous Materials Management

BMP HM-13: Prevent Spills

BMP HM-14: Know the Spill Kit Location

Conclusion

As discussed above under Impact HM-2, the use, handling, storage, disposal, and transportation of hazardous materials is subject to numerous regulations and District BMPs. Compliance of these laws and regulations would minimize the potential of release and spill of hazardous materials in the vicinity of a school. Implementation of BMPs HM-9 through HM-14 would further minimize the potential for releases of fuels and other hazardous materials from construction equipment during construction and ensure proper and prompt response to any accidental spills. However, even with the implementation of these BMPs, there is a chance that contaminated soil discovered during construction could result in exposure of contaminated dust or runoff to the nearby school. Therefore, this impact is considered potentially significant. The District would implement the following MMs to manage the potential for exposure from discovered contaminated soil.

Mitigation Measure HM-1: Conduct a Phase I and Phase II Environmental Site Assessments and Implement Site Remediation Actions Prior to Construction.

The full text of MM HM-1 is presented under Impact HM-1.

With the implementation of MM HM-1, the District would identify any contaminated soil and groundwater in areas of construction excavation and ensure it is properly remediated with appropriate oversight prior to excavation activities. This would ensure that nearby schools would not be exposed to toxic soil or water during District excavation activities. With the implementation of this MM, this impact would be reduced to a less-than-significant level.

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Hydrology, Geomorphology & Water Quality

3.8.1 Introduction

This chapter presents the regulatory setting, environmental setting, and potential impacts of the Proposed Project on hydrology, geomorphology, and water quality resources.

Hydrology is the science of the occurrence, circulation, and distribution of water in the environment. *Geomorphology* is the study of the history and processes that shape the earth's landforms. Fluvial geomorphology is the more specialized study of rivers and streams, including the quantity and timing of watershed runoff that enters rivers (hydrology), the behavior of channelized flows in rivers (hydraulics), and how sediment is variably eroded, transported, and deposited along the river continuum. *Water quality* refers to the chemical, physical, and biological characteristics of water.

This chapter evaluates the potential for the Proposed Project to affect the hydrologic and geomorphic functions of the Sunnyvale Channels and to cause impacts on water quality.

3.8.2 Regulatory Setting

Federal Regulations

Clean Water Act

The Clean Water Act (CWA) is the primary federal law that protects the quality of the nation's surface waters, including lakes, rivers, and coastal wetlands. The key sections of the CWA that pertain to water quality regulation are Sections 303, 401, and 402 (discussed hereunder). Section 404 of the CWA regulates the discharge of dredged and fill materials into Waters of the United States (Waters of the U.S.), and is overseen by the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (USACE). Section 404 requirements are discussed further in Chapter 3.3, "Biological Resources."

Section 303, Impaired Water Bodies

Under CWA Section 303[d], states are required to identify "impaired water bodies" (those that do not meet established water quality standards), identify the pollutants causing the impairment, establish priority rankings for waters on the list, and develop a schedule for

developing control plans to improve water quality. Following listing, EPA then approves the state's recommended list of impaired waters or adds and/or removes water bodies to the list. Each Regional Water Quality Control Board (RWQCB) must update the Section 303[d] list of impaired waters every 2 years. Water bodies on the list have no further assimilative capacity for the identified pollutant, and the Section 303[d] List identifies priorities to develop pollution control plans for each listed water body and pollutant. According to the most current list (2010) the Sunnyvale Channels and are not listed as impaired (SWRCB 2011). However, South San Francisco Bay, which the Sunnyvale Channels drain to, is listed as impaired by chlordane, dichlorodiphenyltrichloroethane (DDT), dieldrin, dioxin compounds, furan compounds, invasive species, mercury, polychlorinated biphenyls (PCBs), and selenium from multiple known and unknown sources (SWRCB 2011).

The pollution control plans triggered by the CWA Section 303[d] List are called Total Maximum Daily Loads (TMDLs). The TMDL is a "pollution budget" designed to restore the health of a polluted body of water. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, thereby ensuring the protection of beneficial uses. A TMDL also contains the target reductions needed to meet water quality standards and allocates those reductions among the pollutant sources in the watershed (point sources, non-point sources, and natural sources). The TMDL process quantifies water quality problems, identifies pollutant sources, and recommends pollutant load reductions or control actions needed to restore and protect the beneficial uses of the impaired water body. The calculation of a TMDL includes a margin of safety and considers seasonal variations (40 CFR § 130.2). TMDLs for the South San Francisco Bay include the San Francisco Bay Mercury TMDL (approved by EPA in 2008), San Francisco Bay PCBs TMDL (approved by EPA in 2010), and Urban Creeks Dioxin Pesticide Toxicity TMDL (approved by EPA in 2007).

Section 401, Water Quality Certification

For an applicant of a federal permit or license to conduct any activity that may result in a discharge of a pollutant to a Water of the U.S., Section 401 of the CWA requires the state to issue a certification that the activity is consistent with the state's water quality standards. The state may grant, grant with technical conditions imposed on the project activity, or deny the Section 401 certification.

The discharge of dredged or fill material into Waters of the U.S., including wetlands, as determined by USACE, is subject to permitting specified under Section 404 of the CWA (Discharges of Dredge or Fill Material), which is administered by USACE. A Section 401 water quality certification is required for all Section 404 permitted activities. In California, the State Water Resources Control Board (SWRCB) and its nine RWQCBs issue water quality certifications. Each RWQCB is responsible for implementing Section 401 in compliance with the CWA and its water quality control plan (also known as a basin plan).

Section 402, National Pollutant Discharge Elimination System

CWA Section 402 regulates discharges to surface waters (other than dredge or fill material) through the National Pollutant Discharge Elimination System (NPDES), administered by EPA. The NPDES program provides for both general permits (those that cover a number of similar or related activities) and individual permits for discharges to Waters of the U.S. This regulation is implemented at the state level and is discussed below.

State Regulations

California Porter-Cologne Water Quality Act

California's Porter-Cologne Water Quality Control Act (Porter-Cologne Act) is the primary state regulation governing water quality. The water quality control plans (or basin plans) and policies established by the San Francisco Bay RWQCB and applicable to the Proposed Project are discussed below. The Porter-Cologne Act was passed in 1969, and together with the CWA, provides regulatory guidance to protect water quality and water resources in the state. The Porter-Cologne Act established the SWRCB and divided California into nine regions, each overseen by a RWQCB. The Porter-Cologne Act established regulatory authority over "waters of the state," which are defined as "any surface water or groundwater, including saline waters, within the boundaries of the state" (California Water Code, Division 7, Section 13050). More specifically, the SWRCB and its nine RWQCBs have jurisdiction over the beds and banks of stream channels, their riparian corridors, and their beneficial uses. The Porter-Cologne Act also assigned responsibility for implementing CWA Sections 303, 401, and 402 within California to the SWRCB and RWQCBs.

The Porter-Cologne Act requires the development and periodic review of water quality control plans (basin plans) for the protection of water quality in each of California's nine regions. A basin plan is unique to each region and must identify beneficial uses, establish water quality objectives for the reasonable protection of the beneficial uses, and establish a program of implementation for achieving the water quality objectives. Basin plans must also comply with Section 303 of the CWA, which requires states to establish their own water quality standards. Basin plans provide the technical basis for the RWQCBs to determine waste discharge requirements, take enforcement actions, and evaluate grant proposals. The portions of Santa Clara County that drain to San Francisco Bay are within the jurisdiction of the San Francisco Bay Basin Plan (San Francisco Bay RWQCB 2011a). The beneficial uses established in the basin plan for surface waters and groundwater basins in the Project Area are shown in **Table 3.8-1**. The Project Area is located within the Santa Clara Basin (surface waters) and Santa Clara Valley Groundwater Basin. The basin plan also establishes standards to protect beneficial uses (i.e., water quality objectives).

Table 3.8-1. Beneficial Uses of Surface Water Bodies and Groundwater Basins in the Project Area

Water Body	Beneficial Uses ¹																		
	AGR	MUN	FRSH	GWR	IND	PROC	COMM	SHELL	COLD	EST	MAR	MIGR	RARE	SPWN	WARM	WILD	REC-1	REC-2	NAV
Santa Clara Basin																			
San Francisco Bay (South)					E		E	E		E		E	E	E		E	E	E	E
Guadalupe Slough										E			E			E	E	E	
Moffett Channel										E						E	E	E	
Groundwater Basin (Sub-Basin)																			
Santa Clara Valley (Santa Clara-Basin No. 2-9.02)	E	E			E	E													

Notes: ¹ Beneficial Uses are defined as: Agricultural Supply (AGR), Cold Freshwater Habitat (COLD), Ocean, Commercial, and Sport Fishing (COMM), Estuarine Habitat (EST), Freshwater Replenishment (FRSH), Groundwater Recharge (GWR), Industrial Service Supply (IND), Marine Habitat (MAR), Fish Migration (MIGR), Municipal and Domestic Supply (MUN), Navigation (NAV), Industrial Process Supply (PRO), Preservation of Rare and Endangered Species (RARE), Water Contact Recreation (REC-1), Non-contact Water Recreation (REC-2), Shellfish Harvesting (SHELL), Fish Spawning (SPWN), Warm Freshwater Habitat (WARM), and Wildlife Habitat (WILD).

E = existing beneficial use

Source: San Francisco Bay RWQCB 2011a.

NPDES Construction General Permit

Construction-related stormwater discharges to Waters of the U.S. are regulated by CWA Section 402 under the SWRCB’s General Permit for Discharges of Storm Water Associated with Construction and Land Disturbance Activities (General Construction Permit). Projects disturbing more than 1 acre of land during construction, including linear projects, are required to file a Notice of Intent and submit a Storm Water Pollution Prevention Plan to the SWRCB to be covered by the General Construction Permit before the onset of construction. Construction activities resulting in soil disturbances of less than 1 acre also are subject to the General Construction Permit, if the construction activity is part of a larger common plan of development that encompasses 1 or more acres of soil disturbance, or if significant water-quality impairment will occur from the activity. Ground disturbance from Project construction activities are estimated to be much greater than 1 acre. The District would obtain an NPDES Construction General Permit, as identified in Chapter 2, “Project Description.”

Municipal Regional Stormwater NPDES Permit

The Municipal Regional Stormwater NPDES permit (Order R2-2009-0074) (San Francisco Bay RWQCB 2009a) covers municipal stormwater discharges from the majority of Bay Area counties and cities. The permit is applicable to Santa Clara County,

the District, the City of Sunnyvale, and other cities and agencies within the county which have joined together to form the SCVURPPP. The Municipal Regional Stormwater NPDES permit establishes discharge prohibitions, annual reporting requirements, construction site controls, water quality monitoring, pesticides toxicity control, trash load reductions, and provisions to address existing TMDLs established for the Bay. The purposes of these measures are to control and reduce the levels of pollution in both stormwater and non-stormwater discharges to storm drains and watercourses; gather concentration and loading information for a number of pollutants of concern; and ensure the implementation of appropriate source control, site design, and stormwater treatment measures in new development and redevelopment projects. The permit was recently amended to refine development categories and low-impact development specifications.

Discharges from the Sunnyvale Channels are covered under the provisions of the NPDES permit, which include prohibiting certain discharges, such as solid wastes, and establishing receiving water limitations, which would cause or contribute to a violation of any applicable water quality standard (San Francisco Bay RWQCB 2011b). The permit also contains hydromodification management (HM) requirements for new development and redevelopment in certain designated areas of Santa Clara County (Order R2-2011-083) (San Francisco Bay RWQCB 2011b). Both of the Sunnyvale Channels are mapped as hardened channels that drain to tidal areas and shown as catchments with greater than or equal to 65% impervious surface under the amended NPDES permit. The HM Standard and associated requirements do not apply to projects in the areas designated as greater than or equal to 65% impervious surface. Therefore, the Sunnyvale Channels are not covered by the HM requirements (San Francisco Bay RWQCB 2009b).

Waste Discharge Requirements Program

State regulations pertaining to the treatment, storage, processing, or disposal of solid waste are found in Title 27, CCR, Section 20005 et seq. (hereafter Title 27). In general, the Waste Discharge Requirements (WDR) Program regulates point discharges that are not subject to the federal CWA. This program differs from the federal NPDES program in that it regulates other types of discharges, such as discharges to groundwater or discharges that occur in a diffused manner (e.g., erosion from soil disturbance or waste discharges to land). Typical activities that affect water quality and are regulated under the WDR Program include discharge of process wastewater not discharging to a sewer (factories, cooling water, etc.); confined animal facilities (dairies, feedlots, etc.); waste containments (landfills, waste ponds, etc.); construction sites; boatyards and shipyards; discharges of pumped groundwater and cleanups (underground tank cleanups, dewatering, spills); material handling areas draining to storm drains; sewage treatment facilities; filling of wetlands; dredging, filling, and disposal of dredge wastes; commercial activities not discharging to a sewer (e.g., factory waste water, storm drain); and waste discharges to land. The scope of the WDR Program also includes the discharge of wastes classified as inert, pursuant to section 20230 of Title 27.

If an operation or discharges from a property or business affect California's surface water, coastal water, or groundwater, a permit to discharge waste is required from the appropriate RWQCB. In the case of disposal of waste to land, such as disposal of excavated sediment from a flood control channel to an upland location, a Report of Waste Discharge (ROWD) must be filed with the appropriate Regional Board to obtain WDRs.

Local Regulations

San Francisco Bay Plan

The San Francisco Bay Conservation and Development Commission (BCDC) is a state agency dedicated to the protection, enhancement, and responsible use of the Bay. BCDC updated the *San Francisco Bay Plan* (Bay Plan) in October 2011, to address expected impacts of climate change in the San Francisco Bay, including sea level rise. The Bay Plan requires sea level rise risk assessments when planning shoreline areas or designing larger shoreline projects within BCDC's jurisdiction (discussed below). If sea level rise and storms that are expected to occur during the life of the project would result in public safety risks, the project must be designed to cope with flood levels expected by mid-century (2050). If it is likely that the project will remain in place longer than mid-century, the applicant must have a plan to address the flood risks expected at the end of the century (BCDC 2011).

BCDC's jurisdiction includes the San Francisco Bay and a 100-foot band from the shoreline. It is also important to note that as sea levels rise, BCDC considers their jurisdiction to move accordingly with rising shorelines. Northern portions of the Project Area are located within BCDC's current jurisdiction. As a part of the Proposed Project, the District will submit applications to BCDC for approval of portions of the Proposed Project within BCDC's jurisdiction.

Santa Clara Valley Water District Freeboard Standards

Freeboard is a safety factor expressed in feet above a known flood elevation intended to take unknown factors that could contribute to flood heights that are greater than the height calculated for a given size flood. The District's *Design Guides for Guidelines and Standards* establishes the District's freeboard requirement for flood protection projects and bridge crossings. The District's freeboard requirements are based on a combination of FEMA guidelines (FEMA 2010), Natural Resource Conservation Service (NRCS) guidelines, and USACE guidelines. The District's minimum freeboard requirements are shown below in **Table 3.8-2**.

City of Sunnyvale General Plan

The following policies contained in the *Sunnyvale General Plan* (City of Sunnyvale 2011) are relevant to the Proposed Project:

Environmental Management – Urban Runoff

- Goal EM-8: Protection of Creeks and Bay “assure the reasonable protection of beneficial uses of creeks and San Francisco Bay, established in the Regional Board’s Basin Plan, and protect environmentally sensitive areas.”
- Policy EM-8.5: Prevent accelerated soil erosion. Continue implementation of a construction site inspection and control program to prevent discharges of sediment from erosion and discharges of other pollutants from new and redevelopment projects.
- Goal EM-9: Adequate Storm Drain System “maintain storm drain system to prevent flooding.”
- Policy EM-9.1: Maintain and operate the storm drain system so that storm waters are drained from 95 percent of the streets within one hour after a storm stops.

Table 3.8-2. Santa Clara Valley Water District Freeboard Requirements

Design Water Surface Elevation / Other Considerations	Freeboard Requirements
<p>A. Project design water surface elevation is <i>above</i> the natural ground surface</p> <p><i>(including where levees/floodwalls raise the predicted water surface elevation to above that of the surrounding floodplain)</i></p>	<ol style="list-style-type: none"> 1. Levees shall have a minimum of 3 feet of freeboard with an additional foot of freeboard required 100 feet of either side of the structures that are within the leveed section of creek or where the flow is constricted such as at bridges. An additional half-foot above the minimum at the upstream end of the levees is also required. To comply, a minimum 3.5 feet of freeboard should be used within leveed sections and 4 feet within 100 feet of bridges or other constrictions (based on FEMA guidelines). 2. Floodwalls should use the same freeboard criteria as for levees (District guideline). 3. If two-tenths of the total energy (depth of flow + $[v^2/2g]$) is greater than the freeboard requirement of (1) or (2) above, then the computed value shall be used for freeboard (based on NRCS guidelines).
<p>B. Project design water surface is <i>below</i> the natural ground surface</p> <p><i>(excluding where levees/floodwalls raise the predicted water surface elevation to above that of the surrounding floodplain)</i></p>	<ol style="list-style-type: none"> 1. One foot of freeboard shall be used for constructed, non-natural channels where large amounts of vegetation are not anticipated in the channel (USACE guideline). 2. For all channels, if two-tenths of the total energy is greater than the freeboard requirement of (1) above then the computed values shall be used for freeboard (NRCS guideline).
<p>C. At Bridges</p>	<ol style="list-style-type: none"> 1. At new bridges, freeboard shall be the same as in the existing or proposed channel either upstream or downstream whichever is greater. When the bridge structure encroaches into the freeboard area, there shall not be an increase in water surface for bank full flow. The intent is to define a system (bridge and channel) with a uniform level of protection (District guideline). 2. Where an existing bridge or culvert can convey the design flow under pressure, it must be structurally sound and must be able to resist the resultant lateral and uplift forces (District guideline).
<p>D. Other freeboard considerations</p>	<ul style="list-style-type: none"> ▪ Evaluate all bridges with debris loads on the piers. Suggest USACE practice of three times pier diameter as blockage. ▪ Freeboard should also contain the flow defined by the 80% confidence limit statistical parameter where practical to do so. ▪ All channels with super-critical flow will use sequent (subsequent) depth plus freeboard. ▪ All channels will include freeboard for super-elevation of water surface at curves in addition to requirements specific above. ▪ In areas of the County where there is the possibility of continued land surface subsidence, additional freeboard allowances should be considered.

3.8.3 Environmental Setting

Surface Water

Hydrologic features at the Project Area include the West Channel, the East Channel, the Moffett Channel (the northern portion of the West Channel), and a portion of Guadalupe Slough. Pond A4, an open-water pond owned by the District, is located between the East Channel and the Moffett Channel. The East and Moffett Channels flank the periphery of Pond A4 before flowing into Guadalupe Slough (Figure 2-1 in Chapter 2, “Project Description”). Pond A4 is not a part of the Project Area, though project activities would occur at several locations immediately adjacent to the pond.

The District has divided the Santa Clara Basin into four Watershed Management Areas for purposes of resource management. The Sunnyvale Channels are located within the West Valley Watershed, an 85-square-mile area that has no reservoirs and contains the Sunnyvale Channels, Calabazas Creek, and San Tomas Aquino Creek. All of these conveyances drain south to north and are subject to tidal influence in their downstream reaches.

Sunnyvale Channels Watershed

The Sunnyvale Channels drain an area of approximately 15 square miles, encompassing portions of the cities of Sunnyvale, Mountain View, and Cupertino, as well as unincorporated Santa Clara County. **Figure 3.8-1** shows the West Valley Watershed, the Sunnyvale Channels watersheds and subwatersheds, as well as other important hydrologic features in the Project Area. Each of the Sunnyvale Channels, Pond A4, and Guadalupe Slough are described further below.

Sunnyvale East Channel

The Sunnyvale East Channel extends approximately 6.5 miles from the confluence with Guadalupe Slough upstream to Interstate (I-) 280 in the south. The channel is nearly parallel to the Sunnyvale West Channel. The East Channel drains an area of approximately 7.25 square miles and is tidally influenced from Guadalupe Slough to approximately halfway between Tasman Drive and U.S. Highway (Hwy) 101. Along the East Channel, land use is dominated by residential homes in the southern areas and by commercial businesses with pockets of residential homes in areas north of the Caltrain station. Land use upstream is primarily residential, with pockets of such commercial uses as shopping centers and gas stations. Photographs of the East Channel are presented in Figure 2-2 (in Chapter 2, “Project Description”).

Sunnyvale West Channel

The Sunnyvale West Channel extends approximately 3 miles from Maude Avenue downstream to its northern boundary near the southwest corner of Pond A4, where it becomes Moffett Channel. The channel drains an area of approximately 7.6 square miles. More than half (a 4.8-square-mile area) of the West Channel watershed area drains to storage areas and is pumped into the West Channel near the southwest corner of Pond A4. The West Channel is tidally influenced from Guadalupe Slough to Mathilda Avenue. The portion of the channel from the City of Sunnyvale Water Pollution Control Plant (WPCP) at Carl Road to the confluence with Guadalupe Slough is referred to as the Moffett Channel. Photographs of the West Channel are presented in Figure 2-2 (in Chapter 2, "Project Description").

Moffett Channel is approximately 4,300 feet long by 125 feet wide and 2 to 15 feet deep (tidal influence varies water depth throughout the day). The Moffett Channel covers an area of roughly 12.4 acres and functions as a conveyance channel for stormwater from the West Channel. Moffett Channel drains to Guadalupe Slough, which flows into the South San Francisco Bay. Moffett Channel is tidally influenced from its direct hydraulic connection with San Francisco Bay via Guadalupe Slough.

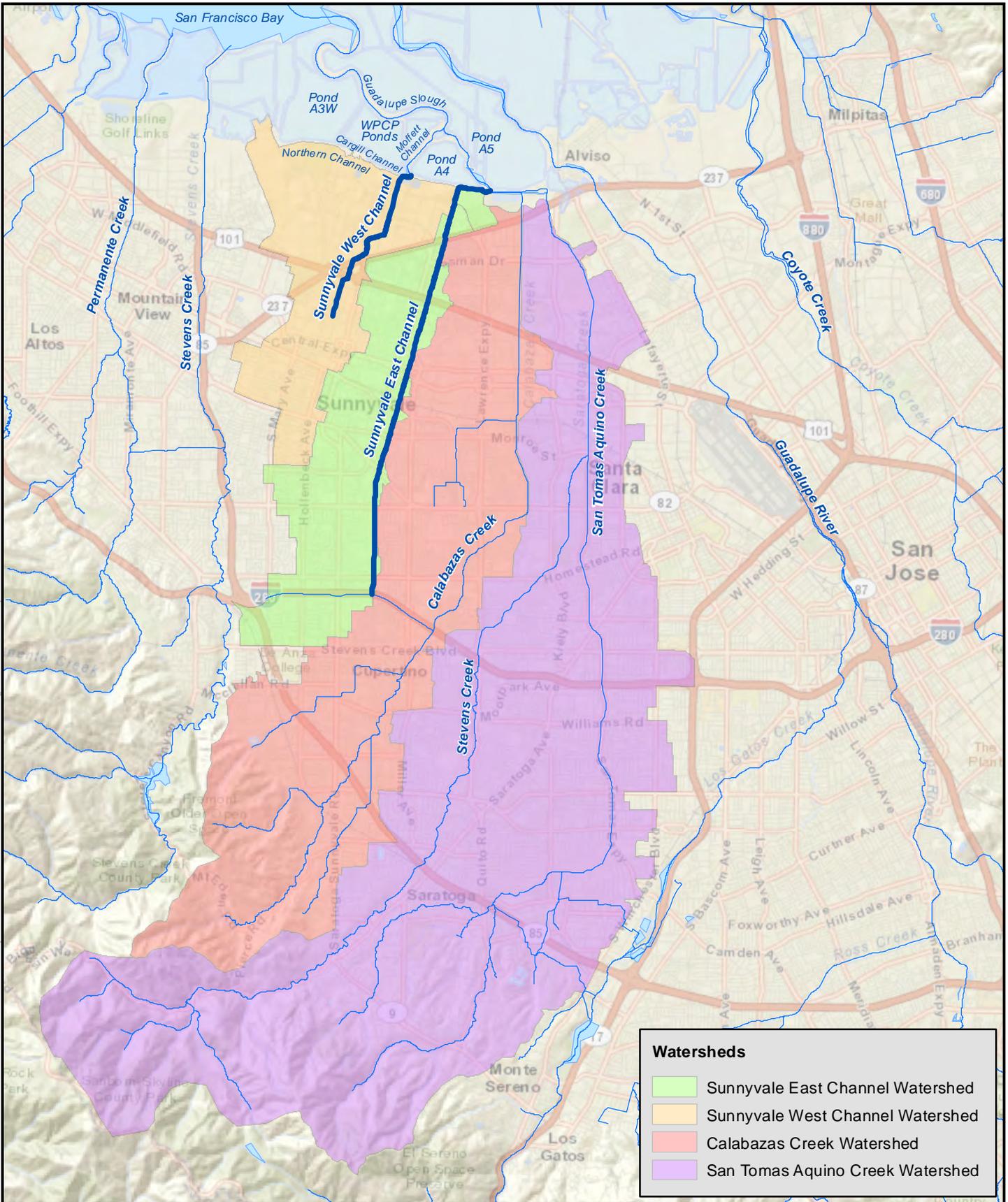
Pond A4 and Guadalupe Slough

Water from the Cargill Channel (immediately to the west) can be siphoned over to Pond A4. Therefore, Pond A4 does not directly receive surface water from the Bay, Guadalupe Slough, or Sunnyvale East Channel or Sunnyvale West Channel via Moffett Channel. However, Pond A4 is likely hydrologically connected by groundwater to its surrounding water bodies. The water in Pond A4 is regularly managed by the District to prevent water quality problems (i.e. high salinity) by pumping water to Pond A5, which draws cleaner water from Cargill channel into the pond (via the siphon) promoting pond circulation. The Sunnyvale East and West Channels ultimately drain to Guadalupe Slough and South San Francisco Bay.

Sunnyvale Channels Hydrology

The watersheds of both Sunnyvale Channels are urbanized with primarily impermeable surfaces. Urbanized lands with a higher proportion of impervious surfaces and reduced infiltration generally demonstrate a rapid runoff response to rainfall events. The Sunnyvale Channels receive urban stormwater runoff and do not have instream impoundments or detention features, leading to rapid runoff responses following rainfall. Within the channel watersheds, land use varies from residential to commercial and industrial, as described for each channel above. There are no substantial continuous open space areas in the channel subwatersheds with the exception of the Sunnyvale Bayland along the shoreline and small parks in Sunnyvale and Cupertino.

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Watersheds

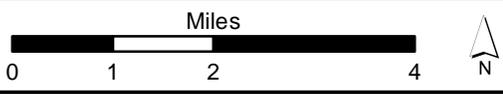
- Sunnyvale East Channel Watershed
- Sunnyvale West Channel Watershed
- Calabazas Creek Watershed
- San Tomas Aquino Creek Watershed



Sources: USGS; SCVWD 2012

**Figure 3.8-1
Sunnyvale Channels
and Local Hydrography**

Prepared for:
Santa Clara Valley Water District
October 2013



*Sunnyvale East and West
Channel Flood Protection Project*

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Flooding within the Sunnyvale Channels is known to occur from a combination of the following conditions:

- Insufficient channel capacity: The channels were originally designed in the 1960s to convey a 10-year flood event. This is because the channels receive most of their inflow from the City of Sunnyvale's storm drain system, which was also designed for a 10-year flood event. During larger flood events, flows to the channels increase, although by a relatively small amount (see **Table 3.8-3** below). As such, overtopping of the channel banks and roadway crossings occurs during high-intensity storm events at locations where the channel is undersized.
- Backwater flows from Calabazas and San Tomas Aquino Creeks during a 100-year storm event: The Calabazas and San Tomas Aquino Creeks discharge flows into the Guadalupe Slough at locations which are upstream of where the Sunnyvale Channels discharge to the Guadalupe Slough. Their watershed sizes and 100-year flows [21 square miles and 3,900 cubic feet per second (cfs) for Calabazas Creek and 45 square miles and 9,200 cfs for San Tomas Aquino Creek] are significantly greater than those of the Sunnyvale Channels. Consequently, during high-intensity storm events the combined flood flows from the Calabazas and San Tomas Aquino Creeks can flow into Guadalupe slough then backflow up and into the Sunnyvale Channels, adding to elevated levels of stormwater runoff already in the channels during storm events.
- Tidal influence: The northern portions of the Sunnyvale Channels are tidally influenced. The mean high tide extends to approximately State Route (SR) 237 on the East Channel and to Matilda Road on the West Channel. High tides experienced during flood events, backwater flows from Calabazas and San Tomas Aquino Creeks in to the Sunnyvale East and West Channels.

Table 3.8-3. Sunnyvale Channels Peak Flow Discharge and 100-year Water Surface Elevation for Existing Channel Conditions

Roadway Crossing / Location	Peak Flow Discharge (cfs)		Water Surface Elevation (100-year) (ft NAVD88) ¹
	10-year (10%)	100-year (1%)	
Sunnyvale East Channel			
Pedestrian bridge near Pond A4 (where channel turns from north to east direction)	900	1,100	13.30
Caribbean Drive	900	1,100	13.88
SR 237	880	1,100	15.43
Tasman Drive	780	980	16.64
Hwy 101	780	980	18.84
Blythe Avenue	690	890	30.02
East Duane Avenue	690	890	34.36
East Arques Road	690	890	51.97
Central Expressway	540	740	56.61
Kifer Road	540	740	63.56
Union Pacific Rail Road	540	740	70.01
Evelyn Avenue	540	740	76.13
Old San Francisco Road	540	740	97.58
El Camino Real	430	560	124.17
Fremont Avenue	310	440	143.44
Dunholme Way	176	250	165.59
Inverness Way	90	170	172.84
Sunnyvale West Channel			
City of Sunnyvale Pump Station No. 1 (downstream of Carl Road)	320	566.32	12.20
Carl Road	320	380	12.24
Caribbean Drive	320	380	12.41
West Java Drive	320	380	13.11
Bordeaux Drive	320	380	13.53
Mathilda Avenue	320	380	14.54
Ross Drive	320	380	21.97
Hwy 101	260	310	28.26
<i>Pumping into Sunnyvale West Channel</i>			
City of Sunnyvale WPCP	-	62	-
City of Sunnyvale Pump Station Number 1	-	105	-
Lockheed Martin, Lockheed Pump Station	-	20	-

Notes: cfs = cubic feet per second

¹ Value from station located immediately downstream from identified roadway crossing

Source: SCVWD 2010; and E. Zedler pers. comm. 2013.

Peak Flow Discharge and Water Surface Elevations

The flood flow distribution (surface runoff) was calculated for the Sunnyvale Channels at several roadway crossings during the 10- and 100-year flood events, using the District's HEC-1 computer model. The flood flow distribution is the quantity of streamflow discharged at different locations along the channels during a flood event. Modeling results are shown in Table 3.8-3.

The flood flow distribution was derived from runoff simulations from the watersheds of both Sunnyvale Channels during 10- and 100-year storm events. The runoff model estimates watershed runoff by using the following data: local precipitation records, a stream gage located upstream of Hwy 101 on the East Channel, soil types, existing watershed land use, location of the storm drain system discharging into the Sunnyvale Channels, and field observations (SCVWD 2010). Water pumped into the West Channel from other (non-runoff) sources was not included in the flood flow distribution model. Water is pumped into the West Channel from the City of Sunnyvale's (City's) WPCP and Pump Station Number 1 and a Lockheed Martin Pump Station. Reasonable estimates of 100-year flood flows from these sources are also shown in Table 3.8-3 (SCVWD 2010). Water surface elevations and other hydraulic parameters were then calculated using the USACE-developed HEC-RAS computer model. Water surface elevations for existing channel conditions are presented in Table 3.8-3. Water surface elevation is the elevation of surface water in the channels during a flood event. The water surface elevation is used to identify locations of channel overtopping and freeboard deficiency (discussed in the section below). Freeboard is the additional vertical height required for infrastructure to be built above a predicted flood elevation to provide capacity for additional but unexpected flood elevations. Freeboard is essentially a safety measure taken to reduce the risk from flood events.

The HEC-RAS model predicted water surface elevations caused mainly by the 100-year watershed runoff conditions and resulting riverine flood flow distribution for the reaches located upstream of the Hwy 101 road crossing on the East Channel and upstream of the Mathilda Avenue road crossing on the West Channel. Downstream of these road crossings, the model results reflected additional hydrologic factors, including tides and backwatering. Both channels contain long, hydraulically steep culverts upstream of these road crossings which induce supercritical flow during the 100-year flow event, which limits the ability of the tides and backwatering effects to propagate upstream. The design downstream water surface elevation was determined with a variable flow (unsteady) HEC RAS model of the west valley watershed during an extreme storm scenario which included the effects of 1) the 100-year flow distributions on the Sunnyvale Channels; 2) the 10-year tidal event, applied to the bay; 3) backwater flows from Calabazas and San Tomas Aquino Creeks during a 100-year flow event; 4) 2 feet of future sea level rise (Emily Zedler pers. comm. 2013; SCVWD 2010). This model assumed that the levees along Guadalupe Slough would hold during the design storm scenario.

Historic Sunnyvale Channels Flooding

Historic flooding of the Sunnyvale Channels resulted from land use changes and increases in groundwater extraction. Groundwater extraction from artesian wells and groundwater pumping between the early 1900s and 1950s to support agriculture caused 8–10 feet of land surface subsidence in the city of Sunnyvale. As a result, the natural drainage pattern of the central Sunnyvale area became disrupted. Flows that would naturally drain into Stevens Creek or Calabazas Creek no longer had an existing drainage path and instead ponded locally and caused flooding. To address the flood risk, the District constructed the Sunnyvale Channels as an integral part of the Sunnyvale's storm drain system from 1959 to 1976.

The watersheds of the Sunnyvale Channels have a history of recurring flooding. Known flooding events in the East and West watersheds are described briefly below. **Figure 3.8-2** delineates areas known to be affected by historic floods (SCVWD 2010).

- **December 1955—Project Area.** In late December 1955, before construction of the East and West Channels was completed, a significant flood event occurred throughout the South San Francisco Bay area that became known as the 1955 Christmas Storm. The northern portions of Sunnyvale, between Calabazas Creek and Stevens Creek, were inundated, as were Mountain View and Palo Alto to the north, and areas of Santa Clara and San José to the south. This event pre-dated the construction of the Channels.
- **January 21–24, 1967—East Channel.** Local ponding occurred in areas discharging to the uncompleted reaches of Sunnyvale East Outfall Channel. The East Channel was later extended.
- **January 22–30, 1983—East and West Channels.** Overtopping of both Channels occurred just upstream of Caribbean Drive. Most of the flooding occurred on parking lots and streets, and water damage to at least one business was reported. A high tide may have influenced the extent of flooding. Overtopping of the East Channel bank north of Evelyn Avenue also occurred, blocking the access tunnel to California Cannery and Growers.
- **February 12–20, 1986—Calabazas Creek and San Tomas Aquino Creek.** Significant overtopping of nearby Calabazas Creek and San Tomas Aquino Creek occurred. Although the flood report for these dates does not mention overtopping of East Channel, part of the flooded area was adjacent to the portion of Sunnyvale East from its Guadalupe Slough confluence to about 2000 feet upstream.
- **February 2–9, 1998—East Channel.** Overtopping on the East Channel occurred at Duane Avenue and downstream of SR 237. Twenty-six businesses and manufacturing properties were flooded.

- **December 2012**—East Channel. Overtopping of the Caribbean Drive bridge crossing was observed by District staff, where flooding of roadway shoulder occurred.

Potential Sunnyvale Channels Flooding

The 100-year floodplain, or the area that has a 1% chance of flooding in any given year, was mapped for the Sunnyvale Channels based on modeling done for FEMA's previous flood insurance study map for the City in 1998 (Figure 3.8-2). FEMA mapping indicates the following four principal areas within the Sunnyvale Channels watersheds would be flooded from a 100-year storm event:

1. The largest flood area is located north of the John W. Christian Greenbelt on the East Channel to the Bay, north of the crossing with Bordeaux Drive on the East Channel to South San Francisco Bay, east to Calabazas Creek, and west to Moffett Field.
2. East of the East Channel, south of Hwy 101, and bound by Duane Avenue on the east and Wolfe Road on the south.
3. Along the East Channel, south of the Union Pacific Railroad bound by Evelyn Avenue, with an area extending south of Evelyn Avenue, bound by Old San Francisco Road on the south, Sequoia Drive on the east, and Pin Oak Drive and the East Channel on the west.
4. An area mapped by FEMA for flooding upstream of El Camino Real was determined by the District not to experience overtopping (SCVWD 2010).

As demonstrated by the historic flooding and the FEMA flood map, the Sunnyvale Channels currently do not provide sufficient flood protection for adjacent areas. **Table 3.8-4** identifies specific reaches of the Sunnyvale Channels that currently are insufficient to convey riverine flows from a 100-year storm event.

Four bridges on East Channel used for the hydraulic analysis: Caribbean Drive, Duane Avenue, Wolfe Road, and Evelyn Avenue. Two bridges on the West Channel overtop during the design storm: Carl Road and Caribbean Drive.

Freeboard Deficiency

Freeboard deficiency is defined as the height by which the existing ground or levee adjacent to the channel must be raised to meet District freeboard standards above a given flow event as shown in Table 3.8-2. Table 3.8-4 shows the maximum freeboard deficiency within each Sunnyvale Channel reach (between road crossings) for the 100-year flow event. These values were calculated by subtracting the existing ground elevation from the sum of the required freeboard height and the 100 year water surface elevation (calculated by the HEC-RAS model, Table 3.8-3).

Table 3.8-4. Sunnyvale Channels Existing 100-Year Flood and Freeboard Deficient Locations

Project Area Reach: Channel Roadway Crossings		Existing Condition Provides 100-Year Flood Capacity?	Maximum Freeboard Deficiency (feet)
Downstream Location	Upstream Location		
Sunnyvale East Channel			
Confluence with Guadalupe Slough	Caribbean Drive	No	6.3
Caribbean Drive	State Route 237	No	6.3
State Route 237	Tasman Drive	Yes	2.6
Tasman Drive	Highway 101	No	4.3
Highway 101	80 feet upstream of Hwy 101	Yes	0.2
80 feet upstream of Hwy 101	Blythe Avenue	Yes	None
Blythe Avenue	Duane Avenue	Yes	0.6
Duane Avenue	Wolfe Road	No	4.5*
Wolfe Road	East Arques Avenue	Yes	0.2
East Arques Avenue	Central Expressway	Yes	0.5
Central Expressway	UPRR	Yes	None
UPRR	East Evelyn Avenue	Yes	0.5
East Evelyn Avenue	155 feet upstream of East Evelyn Avenue	No	4.6*
155 feet upstream of Evelyn Avenue	Old San Francisco Road	Yes	0.7
Old San Francisco Road	El Camino Real	Yes	None
El Camino Real	Fremont Avenue	Yes	None
Fremont Avenue	Inverness Way	Yes	None
Inverness Way	I- 280	Yes	None
Sunnyvale West Channel			
Confluence with Guadalupe Slough	Carl Road	No	4.6
Carl Road	Caribbean Drive	No	5.6
Caribbean Drive	West Java Drive	No	4.8
Java Drive	Bordeaux Drive	No	3.9
Bordeaux Drive	Mathilda Avenue	Yes	1.3
Mathilda Avenue	Ross Drive	Yes	None
Ross Drive	Alamanor Avenue	Yes	None
Alamanor Avenue	Maude Avenue	Yes	None

Notes: None= no freeboard deficiency; freeboard standards currently satisfied.

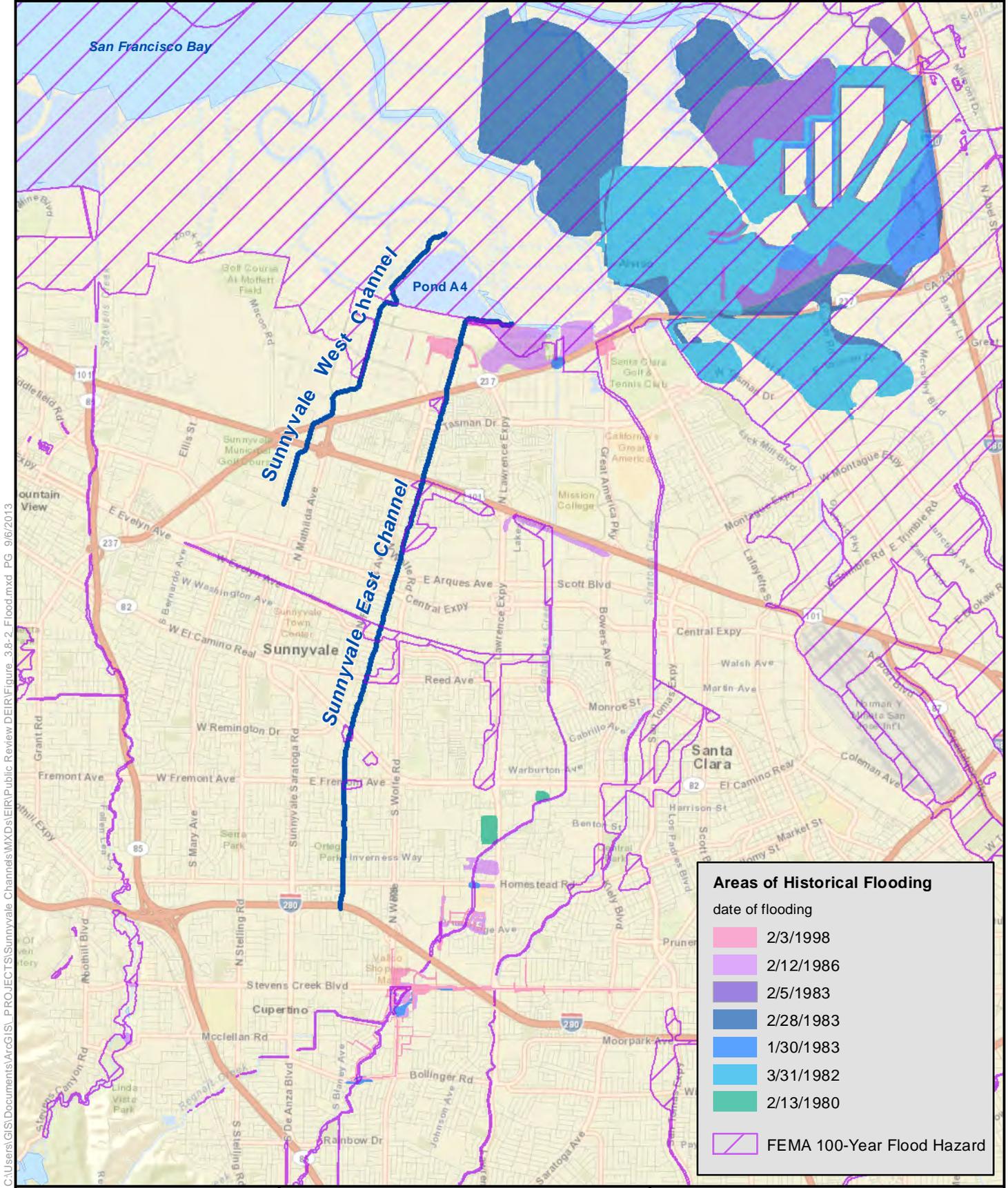
* Existing 100-year water surface elevation would rise above the ground surface. This triggers the 4 ft freeboard requirement.

Source: SCVWD 2010.

Freeboard deficiencies occur along many of the Sunnyvale Channel reaches. Freeboard deficiencies in general are largest in the downstream reaches, where the channel is leveed under existing conditions: downstream of Hwy 101 on Sunnyvale East Channel and downstream of Mathilda Avenue on Sunnyvale West Channel. Along these reaches, 3.5 to 4 feet of freeboard above the 100-year water surface elevation is required. In addition, these reaches are subject to high tides, backwater flow from Calabazas and San Tomas Aquino Creeks, and large flows from its own watershed. This combination can lead to large freeboard deficiency values in the downstream reaches. For example, if the water surface elevation were one foot above the existing levee elevation for the 100-year flow event – i.e., the banks would overtop – the freeboard deficiency would be 4.5 to 5 feet. The greatest freeboard deficiencies of 6.3 feet in the East Channel occur along the two reaches downstream from SR 237 to the East Channel's confluence with Guadalupe Slough. The greatest freeboard deficiency of 5.6 feet in the West Channel occurs along the reach between Carl Road and Caribbean Drive. Note that the freeboard deficiency values presented in Table 3.8-4 reflect the maximum freeboard calculated for a reach; actual freeboard deficiencies vary within each reach.

In the upstream reaches, the freeboard requirement is generally one foot below existing ground elevation, because the existing channel there is not leveed. In addition, the 100-year flows are lower, and these reaches are not tidally influenced and do not receive backwater flows from other creeks. This combination leads to smaller freeboard deficiencies in general, on the order of a half foot. However, if the 100-year water surface elevation rises above the existing ground within a reach, the values in the table use the leveed-reach freeboard requirements of 3.5 to 4 feet instead of 1 foot, which increases the freeboard deficiency calculated for these reaches. There are three such reaches on Sunnyvale East Channel - extending upstream of Duane Avenue, Wolfe Avenue, and Evelyn Avenue at Duane Avenue. In these reaches, the water surface would rise about 0.5 foot above the existing ground elevation, and therefore the freeboard deficiency is quoted as being 4.5 feet (4 feet of required freeboard + 0.5 feet allowance for overtopping). The modifications at the Duane Avenue culvert entrance lower the water surface profile sufficiently to prevent overtopping of the Wolfe Road crossing, which is located about 800 feet upstream. At Evelyn Avenue the 100-year water surface elevation would be about 0.6 foot higher than the existing ground. For Duane Avenue the design is to modify the culvert entrance characteristics and line the channel with concrete in lieu of increasing floodwalls to bring the water surface elevation below the existing ground level. At Evelyn Avenue, the design is to construct high floodwalls to meet the freeboard requirement.

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Sources: USGS; SCVWD 2012; FEMA

Figure 3.8-2
Sunnyvale Channels Historic Flooding and Flood Hazard Areas

Prepared for:
 Santa Clara Valley Water District
 October 2013



Sunnyvale East and West Channel Flood Protection Project

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Groundwater

Shallow groundwater can be found throughout the Project Area. During geotechnical explorations in the Project Area, groundwater was encountered at depths ranging from 10 to 25 feet (SCVWD 2012). **Table 3.8-5** shows the depth to groundwater observed in District-maintained piezometers along the Sunnyvale Channels between 2008 and 2010, including the average, minimum, and maximum depths to groundwater. Average groundwater depth during this period ranged from about 7-43 feet. Groundwater depth is measured as depth below ground; at some locations and dates, the groundwater level was measured to be higher than the channel bed elevation; the Channels are about 10 feet deep on average. Groundwater is closer to sea level near the Guadalupe Slough and slopes upward with the surrounding ground surface to the south. Groundwater levels may fluctuate in response to the tides, variations in rainfall, and the time of year (Emily Zedler pers. comm. 2013).

Table 3.8-5. Sunnyvale Channels Depth to Groundwater

Approximate Location: Channel Roadway Crossing	Depth to Groundwater (feet)			Groundwater table in comparison to channel bed
	Average	Maximum	Minimum	
Sunnyvale East Channel				
Midway along Reach adjacent to the Twin Creeks Sporting Complex	13.7	15.2	12.0	Groundwater above the channel bed half of the year
North of Caribbean Drive	14.5	15.2	13.4	Groundwater below the channel bed
North of SR 237	14.4	14.8	13.6	Groundwater below the channel bed
North of Tasman Drive	14.5	18.6	10.5	Groundwater just below the channel bed
Lakebird Drive	12.2	18.0	10.9	Groundwater at the channel bed
North of Maude Drive	7.7	9.0	7.1	Groundwater above channel bed (channel is always wet)
South of Central Expressway	9.9	10.4	9.4	Groundwater above channel bed (channel is always wet)
South of Bryan Avenue	20.6	22.4	18.8	Groundwater >10 ft below the channel bed
Crescent Avenue	41.7	45.1	38.7	Groundwater >10 ft below the channel bed
Hebrides Way	43.0	44.4	23.6	Groundwater >10 ft below the channel bed

Approximate Location: Channel Roadway Crossing	Depth to Groundwater (feet)			Groundwater table in comparison to channel bed
	Average	Maximum	Minimum	
Sunnyvale West Channel				
South of West Java Drive	12.1	14.7	11.3	Groundwater 3 ft below the channel bed
Bordeaux Drive	9.7	10.5	8.6	Groundwater just below the channel bed

Notes: All depths were recorded in District piezometers between 2008 and 2010.

Source: Emily Zedler pers. comm., 2013.

Coastal Hazards

Sea Level Rise

Sea level rise caused by thermal expansion of water (water expands as it warms) and contribution of melted land-based ice has been observed globally and is expected to continue as the global climate changes. Projecting the effects of sea level rise caused by climate change through modeling is a complex and evolving process. Multiple government agencies and international organizations, including the Intergovernmental Panel on Climate Change (IPCC), USACE, and BCDC, have developed projections for future sea level rise.

IPCC developed six different sea-level-rise scenarios based on predicted increased rises in temperature and future emissions of greenhouse gases. Among the six modeled scenarios, the greatest predicted amount of likely sea level rise was 10–23 inches by the end of the 21st century (2090 to 2099) compared with average sea levels from 1980 to 1999. The IPCC estimates excluded possible future ice flow from Greenland and Antarctica, which could increase the upper ranges of sea level rise by 4–8 inches (IPCC 2007).

USACE modeling of accelerated sea level rise predicts a low estimate of 5.9 inches and a high estimate of 23.6 inches by 2050. Estimates for 2100 are a low of 19.7 inches and a high of 59.1 inches. Consideration of relative sea level change is applied by USACE to every coastal and estuarine feasibility study that is undertaken (USACE 2002).

BCDC projects that sea level within the Bay by 2050 will rise by approximately 16 inches and by 2100 will rise by approximately 55 inches. BCDC used data from the U.S. Geologic Survey to create a series of sea level rise maps showing areas that would be vulnerable to projected sea level rise in 2050 and 2100. The map of the South Bay shoreline areas potentially exposed to sea level rise show that the northern portion of the Project Area would potentially exposed to both a 16- and 55-inch sea level rise. The Sunnyvale Channel are projected to be at risk from 55-inch sea level rise in an area spanning from about 0.75 mile north of the Hwy 101 to South San Francisco Bay (BCDC 2009).

The East Channel is currently tidally influenced from Guadalupe Slough to approximately SR 237. The West Channel is tidally influenced from Guadalupe Slough to Mathilda Avenue. USACE sea level rise projections of 23.6 inches were included in the 100 year water surface profile predications as follows. A steady state HEC-RAS model was generated for the entire length of each channel for the purpose of determining the 100 year water surface profile, which formed the basis for determining the finished floodwall elevations. Sea level rise was included through specification of the starting water surface elevation (i.e., the downstream boundary condition), applied at the location of each channel's confluence with Guadalupe Slough. As discussed above, the starting water surface elevations were determined by running an unsteady HEC RAS model simulating a design storm scenario which specified 100-year flow hydrographs on Sunnyvale West Channel, Sunnyvale East Channel, Calabazas Creek, and San Tomas Aquino Creek and a 10-year tidal signal with 2 feet of sea level rise applied in the bay. In this scenario, the levees along Guadalupe Slough were assumed to hold, allowing tidal flows to overflow from Guadalupe Slough and into Ponds A3W and A5 before reaching Sunnyvale West and East Channels. The values for the starting water surface elevations were set equal to the maximum water surface elevations calculated during the simulated storm scenario: 12.05 ft NAVD88 for Sunnyvale West Channel and 13.15 ft NAVD88 for Sunnyvale East Channel. The value on Sunnyvale East Channel was higher due to backflows from San Tomas Aquino and Calabazas Creeks. For comparison purposes, the estimated 10 and 100 year tidal elevations of the bay at the mouth of Guadalupe Slough are 10.35 ft NAVD88 and 10.85 ft NAVD88 or 12.35 and 12.85 ft NAVD88 with 2 feet of sea level rise, respectively (USACE 1984).

Geomorphic Setting

The Project Area is located in the lower Bay Plain geomorphic setting, composed of medium- to fine-grained alluvium and estuarine deposits. Near the margins of the Bay, estuarine sediments intergrade with fine alluvium at the stream mouths. There are also extensive areas of artificial fill and diked baylands. Many of these deposits were laid during floods when high tides forced estuarine backwatering conditions on the streams trying to reach the Bay. Engineered stream channels in lower watersheds of the South Bay have largely eliminated overbank floodplain processes, whereby lateral channel migration and overbank flooding are now extremely restricted and unlikely.

Along the Sunnyvale Channels, localized streambank erosion may occur when or where erosive forces are greater than the resistant strength of the banks. Bank erosion may occur when saturated banks with high soil moisture slump during or following high water elevations of storm events. At some locations, there might be more stream force directed on the banks (shear stress), or the banks may be inherently weaker or prone to failure owing to their materials or other site-specific conditions, such as the degree of bank slope or soil compaction. The following two sections describe the geomorphic processes of bank erosion and sedimentation in more detail.

Bank Erosion

Erosion along the Sunnyvale Channels is pervasive and includes historic bed (invert) erosion, localized scour, slumping features, toe of bank erosion, and undermining of hardscape features. Such erosion threatens structures located adjacent to the top of the channel banks. Erosion within the Sunnyvale Channels is generally caused by the following conditions:

- Lack of an upstream sediment supply. The upstream/southern portions of the Sunnyvale Channels supply little sediment to the downstream reaches, resulting in historic bed (invert) erosion in the upstream reaches of both channels.
- Insufficient channel right-of-way/easements. The channel easements running along both channels are confined by urban development and provide only a narrow corridor. These easements serve as the primary natural floodplain available for the channels and primarily contain the District's channel maintenance roads and only right-of-way (ROW) available for the channels. The narrow easements typically limit the District's ability to widen channels, decrease the slope of the channel bank slopes, or otherwise lessen the geomorphic processes that cause erosion. As a result of this narrow corridor, many reaches of both channels were designed as straight, trapezoidal channels with steep bank slopes that are prone to erosion.
- Intermittent hardscape and natural channel. This alternating hardscape pattern exists primarily because of the narrow ROW corridor along the Channels. The District has historically repaired bank erosion by installing sacked concrete, rip-rap, or concrete along the channel banks. As a result, sections of natural channel immediately downstream of existing hardscape features are particularly at risk for further erosion problems.
- Multiple road crossings. The Sunnyvale Channels contain numerous bridge/culvert roadway crossings, many of which are hydraulically steep (i.e., are capable of inducing supercritical flow) and contain drop structures capable of downstream scour and deposition.
- Hydromodification of the watershed. The Sunnyvale Channels watershed has been modified from intense urbanization and land development. For storms of the same recurrence interval, urbanization and land development decrease the watershed's time of concentration and increase the peak flow rates and the velocity of channel streamflow.

Erosion sites identified along the Sunnyvale Channels are detailed by reach in **Table 3.8-6**, including the existing channel conditions and site-specific causes of erosion, where known. Locations of the sites listed in Table 3.8-6 are shown in Chapter 2, Figures 2-3a-i. Additional information on slope stability and seepage of the Sunnyvale Channels is provided in Chapter 3.5, "Geology and Soils."

Table 3.8-6: Existing Sunnyvale Channel Erosion Sites and Characteristics

Sunnyvale Channel Reach	Sub-Reach Extent	Length (linear feet)	General Channel Conditions	Existing Site-Specific Erosion Problems and Causes	Proposed Project Erosion Repair
Sunnyvale East Channel					
Tasman Drive to Hwy 101	Reach downstream from the PG&E bypass/ concrete-lined channel to the wingwalls upstream of Tasman Drive	828	Earthen channel bed and both banks	Problems: 1. Toe of bank erosion throughout reach. 2. Toe of bank erosion has exposed the concrete adjacent to the PG&E bypass/concrete-lined channel.	Rock Slope Protection (RSP) in the channel bed and on both banks up to the 10-year water mark; conform to existing wingwalls upstream and downstream
	Reach downstream from the Hwy 101 wingwalls to the PG&E bypass/ concrete-lined channel	824	Earthen channel bed and both banks	Causes: 1. Original channel design had 1.5:1 (horizontal: vertical) bank slopes due to limited right-of-way. 2. Limited supply of sediment from upstream.	
Hwy 101 to Blythe Avenue	Reach downstream from the PG&E bypass/ concrete-lined channel to immediately upstream of the Hwy 101 culvert entrance	748	Earthen channel bed and both banks	Problems: 1. Vertical toe/bank erosion, extending about half way up the banks. This has exposed the footings for the concrete slab surrounding a storm drain outlet. 2. Slumping failures on banks. Causes: 1. Original channel design had 1.5:1 bank slopes due to limited right-of-way. 2. Limited supply of sediment from upstream.	Bench construction on one bank; RSP in channel bed and to the top of both banks
	Reach immediately downstream from the PG&E bypass/concrete-lined channel wingwalls	35	Earthen channel bed and both banks		Bench construction on one bank; RSP in channel bed and banks up to the 10-year water mark; conform to upstream wingwalls
	Reach immediately upstream of the PG&E bypass/ concrete-lined channel wingwalls	35	Earthen channel bed and both banks		Bench construction on one bank; RSP in channel bed and banks up to the 10-year water mark; conform to downstream wingwalls
	Reach between the PG&E bypass concrete-lined	124	Earthen channel bed and both banks		Bench construction on one bank; RSP in channel bed and

Sunnyvale Channel Reach	Sub-Reach Extent	Length (linear feet)	General Channel Conditions	Existing Site-Specific Erosion Problems and Causes	Proposed Project Erosion Repair
	channel/ and Blythe Avenue				up to the top of both banks
	Reach extending immediately downstream of Blythe Ave culvert exit wingwalls	35	Earthen channel bed and both banks		Bench construction on one bank; RSP in channel bed and banks up to the 10-year water mark; conform to upstream wingwalls
Blythe Avenue to East Duane Avenue	Reach extending upstream of the Blythe Ave culvert entrance	365	Earthen channel with a constructed bench on the east bank	Problems: 1. Vertical bank erosion, extending about half to 3/4 the way up the bank. Threatening fences associated with parking lots for apartments or condominiums. 2. Vertical toe of bank erosion, undermining storm drain outfall aprons. Causes: 1. Original channel design had 1.5:1 bank slopes due to limited right-of-way. 2. Limited supply of sediment from upstream. 3. Energetic flow enters this reach from hydraulically steep culvert upstream at East Duane Avenue	RSP in the channel bed and west bank to the top of the bank; no RSP on east bank
	Middle reach	275	Earthen channel with eroded or degrading bed; exposed cutoff wall; sacked concrete slope protection (SCSP) on the west bank		RSP in the channel bed only
	Reach extending immediately downstream of Duane Avenue wingwalls	472	Earthen channel bed and both banks		RSP in the channel bed and both banks up to the 10-year water mark; conform to existing wingwalls upstream and downstream
East Duane Avenue to Wolfe Road	Reach extending immediately upstream of East Duane Avenue	128	Earthen channel west bank with severe erosion and nearly vertical banks; RSP covering the east bank; earthen channel bed	Problems: 1. Earthen channel is sporadic. Severe bank erosion is present everywhere the channel banks are earthen. Causes:	Concrete lining of the channel bed and to the top of both banks

Sunnyvale Channel Reach	Sub-Reach Extent	Length (linear feet)	General Channel Conditions	Existing Site-Specific Erosion Problems and Causes	Proposed Project Erosion Repair
	Middle reach, downstream	102	Earthen channel west bank with nearly vertical banks; SCSP covering the east bank; earthen channel bed	1. Intermittent hardscape throughout this reach. 2. Original channel design had 1.5:1 bank slopes due to limited right-of-way. 3. Limited supply of sediment from upstream.	
	Middle reach	5	SCSP covering both banks; earthen channel bed		
	Middle reach, upstream	95	SCSP covering the west bank; earthen channel east bank with nearly vertical banks; earthen channel bed		
	Reach extending immediately downstream of Wolfe Road	50	SCSP on both banks; earthen channel bed		
Wolfe Road to East Arques Avenue	Reach extending immediately downstream of the East Arques Avenue wingwalls	15	Earthen channel with RSP on both banks; some natural drop structures have also formed	Problems: 1. There is scour and slumping occurring immediately downstream of East Arques Avenue. The dirt has eroded away from the culvert, exposing approximately 2 feet of the wingwall. 2. West bank failure extending to the end of the wingwall immediately downstream of East Arques Avenue; about 35 feet long. 3. East bank failure extending downstream of East Arques Avenue; about 80 feet long. The reach downstream of here also has somewhat stable banks.	RSP in the channel bed and both banks up to the 10-year water mark; conform to existing wingwalls upstream

Sunnyvale Channel Reach	Sub-Reach Extent	Length (linear feet)	General Channel Conditions	Existing Site-Specific Erosion Problems and Causes	Proposed Project Erosion Repair
				<p>Causes:</p> <ol style="list-style-type: none"> 1. High energy flow comes into this reach from East Arques Avenue culvert, due to drop structure within the culvert. 2. Original channel design had 1.5:1 bank slopes due to limited right-of-way. 3. Limited supply of sediment from upstream. 	
East Arques Avenue to Central Expressway	Entire reach	562	Earthen channel bed and both banks	<p>Problems:</p> <ol style="list-style-type: none"> 1. Toe of bank erosion, 1-3 feet along much of this reach. 2. Vertical Banks, up to 4 to 5 feet tall in the upstream reach of the channel. 3. Sediment deposition in the west chamber of the Central Expressway dual-box culvert. <p>Cause:</p> <ol style="list-style-type: none"> 1. Original channel design had 1.5:1 bank slopes due to limited right-of-way. 	RSP in the channel bed and both banks up to the 10-year water mark; conform to existing wingwalls upstream and downstream
Central Expressway to Kifer Rd	Reach extending immediately upstream of the pedestrian bridge	20	Earthen channel bed and both banks	<p>Problem:</p> <ol style="list-style-type: none"> 1. Bank erosion immediately adjacent to and upstream of the wingwalls for the pedestrian bridge has exposed the concrete. <p>Causes:</p> <ol style="list-style-type: none"> 1. Original channel design had 1.5:1 bank slopes due to limited right-of-way. 2. Abrupt transition from earthen banks to concrete wingwalls. 	RSP in the channel bed and both banks up to the 10-year water mark; conform to existing wingwalls downstream

Sunnyvale Channel Reach	Sub-Reach Extent	Length (linear feet)	General Channel Conditions	Existing Site-Specific Erosion Problems and Causes	Proposed Project Erosion Repair
	Middle reach	435	Partially earthen channel and SCSP on both banks; SCSP cutoff walls have been exposed due to channel bed degradation	<p>Problem:</p> <ol style="list-style-type: none"> Degradation of channel bed and toe has caused SCSP cutoff wall to become exposed. <p>Causes:</p> <ol style="list-style-type: none"> Limited supply of sediment from upstream. Channel may have been designed to be too steep. 	RSP in the channel bed only, to protect existing SCSP-covered banks
Kifer Road to Union Pacific Railroad (UPRR)	Downstream half of the reach	150	Mostly earthen channel with some SCSP on both banks.	<p>Problems:</p> <ol style="list-style-type: none"> Channel bed and toe of bank erosion. Channel banks immediately adjacent to Kifer culvert wingwalls have eroded vertically; concrete ends of wingwalls are exposed due to the erosion, which could lead to undermining of the wingwalls. <p>Causes:</p> <ol style="list-style-type: none"> Original channel design had 1.5:1 bank slopes due to limited right-of-way. The earthen channel reach is relatively short and located between two hardscaped reaches. Limited supply of sediment from upstream. 	RSP in the channel bed and both banks up to the 10-year water mark; conform to existing wingwalls downstream and to existing SCSP banks upstream
UPRR to East Evelyn Avenue	Entire reach	416	SCSP covers both banks; earthen channel bed is degrading and has exposed SCSP cutoff walls	<p>Problem:</p> <ol style="list-style-type: none"> Channel bed has degraded 1 to 3 feet along this entire reach; degradation has exposed the cutoff walls which support the SCSP on both banks. <p>Causes:</p> <ol style="list-style-type: none"> Limited supply of sediment from 	RSP in the channel bed only, to protect existing SCSP-covered banks

Sunnyvale Channel Reach	Sub-Reach Extent	Length (linear feet)	General Channel Conditions	Existing Site-Specific Erosion Problems and Causes	Proposed Project Erosion Repair
				upstream.	
East Evelyn Avenue to Old San Francisco Road	Middle reach, downstream	200	Earthen channel west bank; SCSP covering east bank; reaches extending upstream and downstream of this reach are also covered with SCSP on both banks	Problems: 1. Intermittent vertical bank erosion, extending from the toe to the top of bank at a couple of locations. 2. RSP has failed at some locations, rolling into the channel invert. Causes: 1. Original channel design had 1.5:1 bank slopes due to limited right-of-way. 2. Intermittent hardscape throughout this reach.	RSP in the channel bed and on the west bank to the 10-year water mark; no RSP on east bank
	Middle reach	50	Earthen channel on east bank and bed; SCSP on west bank.		RSP in the channel bed and the east bank to the top of the bank; no RSP on west bank
	Middle reach, upstream	825	Earthen channel with 60-70% RSP on the channel bed and both banks, at the edges of the toe		RSP in the channel bed and both banks to the 10-year water mark; conform to existing wingwalls downstream
Old San Francisco Road to Iris Avenue	Middle reach	565	Earthen channel bed and mostly earthen channel banks, with some concrete slabs on both banks; reach extending upstream is completely hardscaped (with SCSP, RSP, and concrete)	Problem: 1. Channel bed has degraded 1 to 3 feet along this entire reach; degradation has exposed the cutoff walls which support the SCSP on both banks. 2. Toe of bank erosion throughout reach. 3. Localized slumping failures on banks. Causes: 1. Original channel design had 1.5:1 bank slopes due to limited right-of-way.	RSP in the channel bed and both banks up to the 10-year water mark; conform to existing wingwalls downstream
	Upstream reach	340	SCSP covering both banks; earthen channel bed is degrading with exposed SCSP cutoff wall		RSP in the channel bed only
Iris Avenue to El Camino Real	Downstream reach	240	SCSP on both banks; earthen channel bed is degrading and has	Problem: 1. Channel bed has degraded 1 to 3 feet along this entire reach; degradation has	RSP in the channel bed only

Sunnyvale Channel Reach	Sub-Reach Extent	Length (linear feet)	General Channel Conditions	Existing Site-Specific Erosion Problems and Causes	Proposed Project Erosion Repair
			exposed the SCSP cutoff wall; reach extending upstream is completely hardscaped	exposed the cutoff walls which support the SCSP on both banks. Causes: 1. Limited supply of sediment from upstream.	
	Downstream reach, middle	245	SCSP covering both banks except the bank toes; earthen channel bank toes and bed	Problem: 1. Channel toe erosion/degradation of about 2-3 feet in depth has exposed SCSP cutoff wall. Cause: 1. Limited supply of sediment from upstream.	RSP in the channel bed only, to protect SCSP cutoff walls
El Camino Real to Crescent Avenue	Downstream reach	375	Earthen channel bed and both banks	Problems: 1. Channel bed and toe of bank erosion. 2. Some slumping failures. Causes: 1. Original channel design had 1.5:1 bank slopes due to limited right-of-way. 2. Limited supply of sediment from upstream.	RSP in channel bed and both banks to the 10-year water mark; conform to existing wingwalls/SCSP downstream
	Middle reach, next to downstream reach	90	Earthen channel bed and west bank; SCSP covering the east bank	Problem: 1. Cutoff wall for SCSP exposed due to toe erosion and/or invert degradation. Causes: 1. Original channel design had 1.5:1 bank slopes due to limited right-of-way. 2. Intermittent hardscape.	RSP in the channel bed and the west bank to the top of the bank; no RSP on east bank
	Middle reach	360	Earthen channel bed and both banks	Problems: 1. Severe channel bend erosion with vertical banks 4-6 feet high. 2. Channel bed and toe erosion and	RSP in the channel bed and both banks to the 10-year water mark

Sunnyvale Channel Reach	Sub-Reach Extent	Length (linear feet)	General Channel Conditions	Existing Site-Specific Erosion Problems and Causes	Proposed Project Erosion Repair
				erosion on channel banks, possibly from maintenance road runoff. Causes: 1. Original channel design had 1.5:1 bank slopes due to limited right-of-way. 2. Bend erosion. 3. Intermittent hardscape.	
	Middle reach, upstream	40	Earthen channel east bank; SCSP covering the west bank	Problem: 1. Cutoff wall for SCSP exposed due to toe erosion. Causes: 1. Original channel design had 1.5:1 bank slopes due to limited right-of-way. 2. Intermittent hardscape.	RSP in the channel bed and the east bank to the top of the channel bank; conform to channel upstream
Crescent Avenue to East Fremont Avenue	Entire reach	792	RSP covering channel bed and both banks	Problems: 1. Vertical bank erosion 4-6 feet in height. Causes: 1. Original channel design had 1.5:1 bank slopes due to limited right-of-way. 2. This reach is located downstream of a culvert with a steep drop structure; this reach receives very energetic flows during storm events.	RSP in the channel bed and both banks to the 10-year water mark; conform to existing wingwalls upstream and downstream
East Fremont Avenue to Ashbourne Drive	Entire reach	70	Earthen channel bed; partially earthen channel on both banks with 60% RSP and SCSP on both banks	Problems: 1. Earthen channel banks have vertical erosion from the channel toe to the top of bank. 2. Existing SCSP & RSP is failing. Causes: 1. Original channel design had 1.5:1	RSP in the channel bed and both banks to the 10-year water mark; conform to existing wingwalls upstream and downstream

Sunnyvale Channel Reach	Sub-Reach Extent	Length (linear feet)	General Channel Conditions	Existing Site-Specific Erosion Problems and Causes	Proposed Project Erosion Repair
				bank slopes due to limited right-of-way. 2. Aging hardscape materials.	
Carlisle Way to Dunholme Way	Middle reach, downstream	15	Earthen channel bed and both banks	Problems: 1. Vertical bank erosion along much of this reach, extending up to 5-6 feet high, on both banks, threatening residents' yards. 2. Some localized sediment deposition in the channel invert. Cause: 1. Original channel design had 1.5:1 bank slopes due to limited right-of-way.	RSP in the channel bed and east bank to the 10-year water mark; conform to existing SCSP channel downstream
	Middle reach, upstream	1015	Earthen channel bed and both banks		RSP in channel bed and both banks to the 10-year water mark; conform to existing wingwalls upstream and downstream
Dunholme Way to Inverness Way	Entire reach	1180	RSP covering channel bed and both banks	Problems: 1. Erosion around the channel bend. 2. Vertical toe of bank erosion for most of the channel distance. Possibly due to soil types or unstable channel banks. 3. RSP has fallen off banks into the channel invert. 4. There has also been some aggradation of the channel invert; water ponds downstream of Inverness Channel (year-round) and flows in a trickle towards Dunholme Way. Causes: 1. Original channel design had 1.5:1 bank slopes due to limited right-of-way. 2. Channel bend erosion. 3. Aging RSP. 4. The "aggradation" may be due to modifications of the maintenance road. The Maintenance road on west side of	RSP in the channel bed and both banks to the 10-year water mark; conform to existing wingwalls upstream

Sunnyvale Channel Reach	Sub-Reach Extent	Length (linear feet)	General Channel Conditions	Existing Site-Specific Erosion Problems and Causes	Proposed Project Erosion Repair
Sunnyvale West Channel					
West Java Drive to Bordeaux Drive	Entire reach	1871	Earthen channel bed and both banks	<p>Problems:</p> <ol style="list-style-type: none"> 1. Channel bed and toe erosion along entire reach. 2. Vertical banks in some areas, especially around bends. <p>Causes:</p> <ol style="list-style-type: none"> 1. Part of original channel design had 1.5:1 bank slopes due to limited right-of-way. 2. Channel bend erosion. 	RSP in the channel bed and both banks to the 10-year water mark
Bordeaux Drive to Mathilda Avenue	Entire reach	803	Earthen channel bed and both banks	<p>Problems:</p> <ol style="list-style-type: none"> 1. Channel bed and toe of bank erosion throughout reach. 2. Channel invert degradation of 1-3 feet; invert profile has become nearly horizontal. 3. Vertical bank erosion and slumping failures at some locations. <p>Causes:</p> <ol style="list-style-type: none"> 1. Flow entering the upstream end of this reach is critical and highly energetic, coming from a long, hydraulically steep, concrete-lined box culvert. The flow impinges on the West bank as it enters the reach from the Mathilda Ave Culvert. 	RSP in the channel bed and both banks to the 10-year water mark

Sunnyvale Channel Reach	Sub-Reach Extent	Length (linear feet)	General Channel Conditions	Existing Site-Specific Erosion Problems and Causes	Proposed Project Erosion Repair
				2. Original channel design had 1.5:1 bank slopes due to limited right-of-way.	
Ross Drive to Hwy 101	Reach extending immediately upstream of the Ross Drive wingwalls	25	Earthen channel bed and both banks	Problem: 1. Scour immediately upstream of Ross Drive wingwalls. Cause: 1. Transition from earthen channel to wingwalls not protected.	RSP in the channel bed and both banks to the top of the wingwall elevation
	Reach extending immediately downstream of the Hwy 101 wingwalls	65	Earthen channel bed and both banks	Problems: 1. Scour immediately adjacent to SCSP extending downstream of Hwy 101 culvert. Causes: 1. Scour downstream of box culvert.	RSP in the channel bed and both banks to the top of wingwall elevation/approximately the 10 year water mark
Hwy 101 to Parking lot where channel is diverted into a culvert	Entire reach	182	Earthen channel bed and both banks; Reach contains significant bend	Problems: 1. Scour immediately adjacent to both upstream and downstream wingwalls. 2. Channel bed, toe and bank erosion around channel bend. Causes: 1. Lack of sediment supply to this reach (upstream water comes from storm drain system, not a natural watershed). 2. Significant bend in channel in middle of reach.	RSP in the channel bed and both banks to the top of wingwall elevation/approximately the 10 year water mark
End of parking lot culvert to end of the open channel	Entire reach	10	Earthen channel bed and both banks	Problem: 1. Scour immediately downstream of the wingwalls. Causes: 1. Lack of sediment supply from upstream (i.e., has no upstream	RSP in the channel bed and both banks to the top of wingwall elevation/approximately the 10 year water mark

Sunnyvale Channel Reach	Sub-Reach Extent	Length (linear feet)	General Channel Conditions	Existing Site-Specific Erosion Problems and Causes	Proposed Project Erosion Repair
				watershed). 2. Flow coming to reach may be energetic; culvert here is only 2 feet tall so flow may become pressurized during high flow events.	

Notes: RSP = rock slope protection; SCSP = sacked concrete slope protection
 Source: E. Zedler pers. comm. 2013.

Sedimentation

Within the Sunnyvale Channels, sedimentation generally results either from sedimentation of bay mud in tidal reaches or from local sedimentation downstream of storm drains. Such sedimentation has required sediment removal in the past to preserve the conveyance capacity of channel reaches. Past sediment removal has occurred primarily in the tidal reaches of the East and West Channels. Other typically less problematic sedimentation sites are located outside the tidal zone and downstream of several culverts on the East Channel, including the Hwy 101 culvert/bridge crossing of the channel (SCVWD 2010) where sediment collects.

Surface Water Quality

Ambient water and soil quality in the Project Area is influenced by numerous natural and artificial sources of contamination, including soil erosion, stormwater runoff, recreation activities, municipal point sources, and agriculture. As presented under the CWA Section 303 discussion above, the Sunnyvale Channels are not listed as impaired. However, the South San Francisco Bay is listed as impaired by chlordane, DDT, dieldrin, dioxin compounds, furan compounds, invasive species, mercury, pesticide toxicity, PCBs, and selenium from multiple known and unknown sources from within the Bay and from tributaries to the Bay (SWRCB 2011).

The Project Area was historically used for agriculture, primarily row crops and orchards. After significant flooding of the area in 1955, the Sunnyvale Channels were constructed in the early 1960s. Legacy soil contamination from pesticides is present along the entire length of channels and within channel levees and berms, probably from past agricultural practices (TRC 2007). Currently, commercial businesses in the Project Area include research and development facilities, electronic component manufacturing firms, and other businesses that may store and use hazardous materials. Several businesses have reported spill incidents in the area. See Chapter 3.4, "Hazardous Materials," for further discussion on past and present soil and groundwater contamination in the Project Area.

Land use in the West Channel drainage area is primarily commercial and industrial with some residential, with little to no open, undeveloped areas. Soil and groundwater contamination from past and current land practices, and runoff from the urbanized watershed, are expected to influence the quality of storm runoff flowing in the channel, and ultimately into South San Francisco Bay. The area along the southern boundary of Pond A4 supports a portion of the San Francisco Bay Trail, the City's WPCP, Sunnyvale Materials Recovery and Transfer (SMaRT) Station, and the former Sunnyvale Landfill.

Water and soil quality characteristics in the East Channel watershed are similar to the West Channel. Soil and shallow groundwater contamination is known to be present at gas station sites in the vicinity of the channel. These contaminated sites are in various stages of monitoring and cleanup (see Chapter 3.4, "Hazardous Materials," for further information on these sites). The East Channel likely receives a higher quantity of urban

pollutants, especially those associated with vehicles, compared with the West Channel, owing to receipt of runoff from I-280, Hwy 101, SR 237, and other major roads in the drainage area, such as the Central Expressway and El Camino Real.

Project Area - Surface Water and Soil Quality

The District has completed three water quality investigations of the Sunnyvale Channels and Pond A4. The goal of these investigations, in general, was to characterize the quality of water and sediment flowing into and out of the Project Area. Each of these sampling reports is summarized below.

A study conducted by Tetra Tech EM, Inc., in 2004 involved collection and analysis of sediment samples at 11 locations in and around Moffett Channel, Lockheed Channel, West Channel, and near the City's WPCP outfall. Sediment samples were collected at the channel bed and 3-5 feet below the channel bed. The samples contained elevated levels of DDT and PCBs, probably from past agricultural practices in the Project Area. The results indicated that the contamination is below thresholds for hazardous waste and human health screening levels, but that sediment is unsuitable for use in wetland restoration projects. However, the soil samples did not contain contaminants at hazardous levels at or above human health screening levels, and the soil could potentially meet criteria for disposal at upland locations or landfills (Tetra Tech 2004).

Between 2002 and 2004, CH2M Hill conducted a study of sediment in Pond A4 and the surrounding levees, Moffett Channel, Guadalupe Slough, and the northern portion of the East Channel (CH2M Hill 2005). The purpose of the investigation was to determine potential limitations of transforming Pond A4 into a self-sustaining tidal wetland. Soil samples were collected from 16 borings in levees surrounding the pond, 30 borings within the pond, and 8 borings in the Guadalupe Slough, Moffett Channel, and the unnamed channel south of Pond A4. Additionally, surface water samples were obtained from within the pond and from sloughs and drainage channels surrounding the pond during different tidal and seasonal conditions, and during storm events. Groundwater sampling at monitoring wells along the south levee was also conducted quarterly between May 2003 and March 2004. Levee samples were collected in 2002 and 2003 from depths ranging from the surface to 15 feet below the top of the levees. Pond sediment samples were collected in 2003 from 1 to 10 feet below the pond bottom. The channel sediment samples were collected from the upper 6-12 inches below the channel bottom. Samples were analyzed for total petroleum hydrocarbon (TPH), total organic carbon (TOC), volatile organic compounds (VOCs), PCBs, and metals. Water samples were also tested for general chemistry characteristics, including nutrients. Test results indicated elevated levels of DDT, PCBs, some metals, and polyaromatic hydrocarbons (PAHs), and that sediment would generally not meet reuse criteria for wetland restoration projects. The tests indicated that leachable chromium is potentially present in levees surrounding the pond and within pond sediments. Potential leachable chromium and lead may be present in the sediment of channels surrounding the pond. Additional testing of sediment in and around the pond was recommended to determine the

appropriate waste classification, but the soil would likely meet criteria for disposal at a Class III landfill and is not hazardous waste. The results from the surface water and groundwater tests indicated that elevated levels of metals (copper, lead, nickel, and zinc) are present in the pond and surrounding channels (CH2M Hill 2005).

In 2010, Michael L. Johnson, LLC, conducted a study of water and sediment quality at seven sites in and around Pond A4. In addition to Pond A4, samples were taken at Guadalupe Slough, the East Channel, the West Channel, and inputs to the Moffett Channel. The objective of this sampling effort was to assess potential risks from movement of water and sediment into and out of Pond A4. Data showed typical concentrations of pollutants commonly found in stormwater runoff. Concentrations of dissolved oxygen, pH, methyl mercury, and copper exceeded basin plan water-quality objectives in water at the sites sampled. Several pyrethroids and metals were detected in sediment sampled at the sites. However, no toxicity was observed from sediment samples tested. Nonetheless, methyl mercury levels in the sediment of Pond A4 were above the average Bay sediment concentrations. The report recommended additional benthic invertebrate testing for mercury in Pond A4 and Guadalupe Slough, to determine whether discharges from the Pond A4 to the Guadalupe Slough would increase mercury levels in the slough (Michael Johnson LLC 2011).

Overall, water and sediment quality characteristics of the Project Area are indicative of the heavily urbanized area and legacy contamination from past land uses. Levees and berms along the channels may contain areas of contaminated soil, but previous sampling indicates concentrations will likely be below human health effects levels and hazardous waste criteria. Excavated sediment requiring disposal may exhibit elevated contaminant concentrations.

3.8.4 Impact Analysis

Criteria for Determining Significance

Hydrology and Geomorphology

The Proposed Project would have a significant impact on hydrologic and geomorphic resources if it would:

- a) Substantially deplete surface hydrologic processes that support water supplies;
- b) Alter the physical alignment, position, or structure of streams or drainage courses and the resulting stream network in the Project Area;
- c) Change the timing or amount of runoff or streamflow, which would result in substantial erosion, siltation, or stream instability;

- d) Generate or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems;
- e) Substantially deplete or interfere substantially with surface hydrologic processes that support groundwater recharge such that there would be a reduction in aquifer volume or a lowering of the local groundwater table level;
- f) Place structures within a 100-year flood-hazard area that would impede or redirect flood flows;
- g) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam; or
- h) Expose people or structures to a significant risk of inundation by seiche, tsunami, or mudflow.

Water Quality

The Proposed Project would be considered to have a significant impact on water quality if it would:

- a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality; or
- b) Create or contribute substantial additional source of polluted runoff.

Topics Dismissed in the Initial Study Checklist

The Proposed Project would not involve use of groundwater or surface water supplies. Therefore, the Initial Study Checklist (IS) dismissed potential impacts on groundwater and surface water supplies from further analysis. The IS dismissed potential impacts on groundwater recharge from further analysis because the Project would not substantially affect existing groundwater recharge in the Project Area.

The Proposed Project would not generate additional stormwater runoff; the Project would be designed to manage existing stormwater runoff and improve the capacity of the existing stormwater drainage system. Therefore, the IS dismissed potential impacts related to stormwater runoff because there would be no impact.

The primary objective of the Project is to improve flood protection. Therefore, the IS dismissed potential impacts related to creation of 100-year flood protection hazards. Similarly, the potential for exposure of people or structures to inundation by seiche, tsunami, or mudflow would be reduced by the added flood protection provided by Proposed Project. The Project would place structures in the area potentially influenced by floods, seiche, and tsunami events. However, the structures would not substantially impede or exacerbate flooding conditions due to their parallel orientation with flood flow direction. The Project Area is flat and urbanized and is not at risk of a mudflow event. Overall, the Project would beneficially affect flood protection.

Methodology

Potential direct and indirect impacts on hydrologic conditions and geomorphic processes were evaluated based on how the Proposed Project would affect hydrologic or geomorphic functions. Potential direct and indirect impacts on water quality from the Proposed Project were assessed qualitatively, based on the degree to which construction of the Proposed Project could result in violations of water quality standards, impairments of beneficial uses, or water quality conditions that could be harmful to aquatic life or human health. Additionally, potential temporary and permanent impacts were evaluated.

Project maintenance would occur as needed and may involve activities such as sediment removal and vegetation management, from within the Sunnyvale Channels, which could temporarily affect water quality. However, this EIR does not evaluate Project maintenance activities, which are covered under the District's Stream Maintenance Program Subsequent EIR (refer to Chapter 2.0, "Project Description"). The Stream Maintenance Program Final Subsequent EIR is available for review online: <http://valleywater.org/SMPSEIR2011.aspx>. See Volume 2, Chapter 3, impact discussions in Sections 3.7 for Hydrology and Geomorphology and Section 3.13 for Water Quality.

The presence of historic and existing hazardous materials sites in the Project vicinity makes it possible that contaminated soil could occur within the Project Area. Project construction activities have the potential to discover unknown contaminated soil and groundwater. Impacts related to the potential exposure and release of contaminated soil and contaminated groundwater are evaluated in Chapter 3.7, "Hazards and Hazardous Materials." Potential impacts specifically on water quality from contaminated soil and groundwater discovered during Project construction activities are discussed below in this section.

Environmental Impacts

The impact discussions below are structured as follows. First, the environmental impacts of the Proposed Project in the absence of best management practices (BMPs) are discussed. The discussion then presents applicable District BMPs that would avoid or minimize the level of impact. A conclusion regarding the significance of the environmental impact is then made (considering implementation of the District BMPs, as applicable). If the impact would be significant even with use of BMPs, mitigation measures (MMs) are prescribed. The residual significance of each impact following application of the MMs is then provided.

Hydrology and Geomorphology Impacts

Impact HYD/WQ-1: Effects on Erosion, Sedimentation, or Stream Instability from the Proposed Project – Less than Significant

The Proposed Project would repair existing erosion sites throughout the Sunnyvale Channels by strengthening bank materials, primarily with rock slope protection (RSP), with some applications of sacked concrete slope protection (SCSP) and concrete lining. The Project would also include stabilizing the area around existing outfalls that discharge into the channels and regrading channel banks with erosion repairs and levee modifications.

The Proposed Project would not affect or alter the alignment or position of streams (the drainage network), including culverts discharging into the Sunnyvale Channels or the route and destination of water conveyed by the Sunnyvale Channels. The project would not result in increased runoff from the watershed that is delivered to the channels. Existing stormwater outfalls would be maintained and repaired similar to under existing conditions.

Under the project, rock would be placed on the channel bed or banks as follows:

- 2,180 linear feet of rock would replace existing earthen channel bed;
- 646 linear feet of rock would replace existing earthen bank (on one side of the channel) and also along the bed where these bank repairs occur; and
- 11,291 linear feet of rock would replace existing earthen channel banks (on both sides of the channel) and also along the bed where these bank repairs occur.

Direct Effect of Rock Slope Protection and Rock Channel Lining

Under existing conditions, the Sunnyvale Channels have numerous sites with extensive bank erosion. As described above and shown in Table 3.8-6, erosion at these sites includes historic bed (invert) erosion, localized scour, slumping failures, toe of bank erosion, and undermining of hardscape features. Erosion along the Sunnyvale Channels generally occurs as a result of steep stream banks, insufficient channel ROW/easements that require steep banks, intermittent hardscape features, natural channel conditions, channel restrictions at multiple road crossings, lack of an upstream sediment supply, and hydromodification of the Sunnyvale Channels watershed. Table 3.8-6 identifies specific erosion sites throughout the Sunnyvale Channels, including the existing conditions of the channels (earthen channel or RSP/SCSP), the current erosion problem at the site, and the likely cause of site-specific erosion.

Existing erosion sites would be repaired and stabilized through the Proposed Project by generally installing RSP in combination with a stable bank design. . Table 3.8-6 identifies the specific erosion repairs proposed by the Project at each existing erosion site.

Overall, approximately 15,077 linear feet (2.86 miles) of existing erosion sites would be repaired by the Proposed Project.

The general approach is to install RSP up to the 10-year event water elevation and not the top of the channel bank. The channel bank above the rock would be regraded to a 2:1 slope (refer to Figure 2-11 in Chapter 2, "Project Description"). Levee raising and levee enlargements would also involve regrading channel banks to a more stable 2:1 slope. After the bank grading process, the District would cover the banks with erosion control fabric and hydro-seed to reduce the post construction erosion potential.

Long-Term Direct Effect of Replacement of Earthen Banks with Hardened Material

Where earthen stream banks would be replaced with RSP, SCSP, or concrete material, an overall "hardening" of the stream bank would result in those locations. Hardened banks are considered a long-term adverse impact due to loss of natural earthen bed and banks which provide subsurface groundwater connectivity and opportunities for vegetation to establish. However, as described above in the "Environmental Setting" section, the baseline condition of the Sunnyvale Channels support little to no vegetation, have highly compacted soils and thus provide minimal connectivity to subsurface groundwater, and the banks experience ongoing erosion. The channels currently function as if their banks are hardened. Due to the existing highly modified condition of the channels, strengthening the banks further would minimally affect channel hydrology and geomorphology. Because of the low functioning baseline condition of the existing stream banks, replacement of earthen banks with hardened material is considered a less-than-significant impact.

Direct Reduction in Erosion due to Wingwall and Outfall Bank Stabilization

There is erosion at some existing culvert wingwall and outfall locations where the transition from the concrete facility to the earthen streambank has destabilized. The Proposed project includes repairing these erosion sites through improving the transition zones and small spans (~ 5 ft.) of concrete on the channel at several locations. This would eliminate or reduce existing erosion and improve the long-term channel slope stability, thereby reducing the potential for expanded or new erosion and undermining of these structures in the future.

Approximately 5 feet of concrete would be installed from the edge of existing wingwall structures, at two locations on the West Channel and 24 locations on the East Channel. Approximately 2 feet of concrete would be installed around existing outfall structures at 24 locations on the East Channel.

Direct Effect of Bridge Reconstruction and Box Culvert Extensions on Channel Erosion

Installation of box culverts would modify the channel geometry and could change streamflow and sedimentation processes in these areas and immediately downstream. The Project would involve reconstruction of the Carl Road bridge on the West Channel and replacing the existing concrete box culvert; reconstruction of the Caribbean Drive bridge on the East Channel and installing a triple cell box culvert; and extension of the West Java Drive culvert enlarging the upstream and downstream ends of the existing box culvert.

In general, the box culverts at Carl Road and Caribbean Drive would provide slightly larger capacity under these bridges than currently exists. No substantial localized erosion is expected to occur at the location of box culverts.

New box culverts would be buried into the existing channel, such that the bottom surface of the box culvert would be below the existing channel bed elevation. At Carl Road, the bottom culvert surface would be buried 3 feet below the channel bed; at Caribbean Drive the culvert bottom would be buried approximately 2 feet. The culvert extensions at West Java Drive would be built such that the bottom surface of the box culvert conforms to the existing culvert, which is not buried under existing conditions. After construction, natural sediment accretion would bury the bottom of the new culvert, restoring the bed elevation to its current condition.

Increased Channel Capacity during Storm Events

Any increase in the amount of streamflow in the Sunnyvale Channels as a result of the Proposed Project, is not expected to increase erosion or scouring within the channels.

Following implementation of the Project's flood protection improvements, increased flows in the Sunnyvale Channels would potentially occur during flood events larger than the 10-year storm event. At present, the channels are designed to convey flows from approximately a 10-year storm event. Floodwalls and headwalls developed for the Project would increase channel capacity to contain flows for 100-year storms, as a result of freeboard developed by the Project. As such, flows that currently overtop the channels during events greater than the 10-year recurrence interval would be contained within the channels and floodwalls, levees or headwalls, and would flow downstream to Guadalupe Slough. The potential increase in streamflow during post-Project conditions is expected to be limited as a result of: 1) the limited capacity of the City's stormwater system discharging into the Sunnyvale Channels (approximately 10-year capacity); and 2) the lack of upstream watershed source area for both of the Sunnyvale Channels.

The difference in the Sunnyvale Channels' peak flow discharge for 10- and 100-year flood events (Table 3.8-3) provides an estimate of the potential increase in flood flows conveyed in the channels after development of the Project (during post-Project conditions). As shown in Table 3.8-3, along the East Channel, the increase in discharge

from the estimated 10-year flow event to the 100-year flow event is about 200 cubic feet per second (cfs) for locations where the 10-year flow is 500 cfs or greater, and represents about a 100+ cfs increase for locations on the East Channel with 10-year flows less than 500 cfs. The accompanying increase in surface water elevations from the estimated 100-year event is also shown in Table 3.8-3. Flow changes along the West Channel from the 10-year to the 100-year event are also shown and are not as great as at the East Channel. At the West Channel, the discharge estimate increases about 60 cfs at most locations between the 10-year and 100-year discharge.

These flow estimates are based on hydraulic modeling and, while they provide a good basis to evaluate general conditions and potential changes, there is still uncertainty regarding the potential amount and duration of flow increases in post-Project channels. This uncertainty exists because: 1) there is evidence of existing bridges being currently overtopped from less than 10-year events, such as at Caribbean Drive on the East Channel in December 2012 (estimated by the District to be approximately a 2-year event (Stephen Ferranti pers. comm. 2013); 2) the lag-time between runoff and peak flows is unknown; and 3) the amount of flow that returns to the channel after spilling out during a larger than 10-year event is unknown.

Overall, a slight-to-moderate temporary and infrequent increase in flows is expected in the Sunnyvale Channels after development of flood protection improvements. The slight increase in flows would be contained by floodwalls, headwalls, modified levees, and enlarged bridge/culverts developed by the Proposed Project, and would augment flood flows currently contained within the channels and channel easements. As a result, new/increased flows would not likely come into contact with exposed soil surfaces or areas where water levels are low. As a result, it is not expected that flood protection improvements would cause new erosion or scour within the Sunnyvale Channels or in the downstream Guadalupe Slough.

Sediment Removal

As described in Chapter 2. Project Description, the District would remove sediment from the channel at four locations during Project construction. Sediment removal would increase/restore channel capacity at these locations. This would result in a beneficial effect on flood capacity and water quality. The channels were constructed to a specific design and the sediment removal action would restore the channel to its original design. There would be no long-term change in stream instability and this action would not result in increased erosion or sedimentation.

Applicable Best Management Practices

No District best management practices (BMPs) are applicable to this impact.

Conclusion

The Proposed Project would alter existing hydrologic and geomorphic conditions of the Sunnyvale Channels. However, the Project is expected to result in a net reduction in channel erosion, sedimentation, and stream instability through the slope protection and bank stabilization components of the Project. The long-term effect of hardening channel banks by placement of rock and concrete in the channel would minimally affect hydrologic and geomorphic functioning, including erosion, sedimentation, and stream instability. Proposed flood protection improvements, including floodwalls, levee enlargements, bridge/culvert modifications, and sediment removal, are not anticipated to cause erosion, sedimentation, or stream instability. Therefore, potential impacts of the Proposed Project on hydrology and channel geomorphology are considered less than significant.

Impact HYD/WQ-2: Changes in Surface Runoff from New Impervious Surfaces for Maintenance Road Improvements – Less than Significant

The large majority of the drainage area of the Sunnyvale Channels is impervious due to urban developments. If channel maintenance roads are paved, new impervious surfaces would be introduced to the Sunnyvale Channel drainage areas. Channel maintenance roads are currently composed of aggregate base rock, which allows a small amount of water to infiltrate to the subsurface. The infiltration capacity of the existing roads is likely minimal owing to the high degree of compaction and vehicle use on the roads.

Asphalt paving of channel maintenance roads would occur on the west bank of the West Channel, between Caribbean Drive and Mathilda Avenue. Asphalt paving of the channel maintenance road along one reach on the East Channel would occur between Tasman Drive and the John C. Christianson Greenbelt (immediately north of Hwy 101). Paved roads would be 10 feet wide.

Applicable Best Management Practices

No District BMPs are applicable to this impact.

Conclusion

Paving of the maintenance roads along the Sunnyvale Channels would introduce new impervious surfaces and generate storm runoff. However, because the paved surface area would be nominal in comparison to the surrounding impervious area in the watershed, and the maintenance roads currently provide little infiltration functioning, any changes in runoff and associated effects on erosion or sedimentation in the channels are expected to be minimal. Therefore, this impact is considered to be less than significant.

Water Quality Impacts

Impact HYD/WQ-3: Water Quality Impacts due to Discharge of Contaminated Soil or Groundwater – Less than Significant with Mitigation

Project construction activities in the Project Area, which includes the Sunnyvale Channels, the District's existing channel easements/ROW, and properties permanently and temporarily acquired for the Project, may adversely affect water quality during Project construction. Water bodies potentially affected by the Proposed Project may include Pond A4 (potentially influenced by groundwater) and Guadalupe Slough, in addition to the Sunnyvale Channels.

Known and Unknown Contamination

As discussed in Chapter 3.7, "Hazards and Hazardous Materials," an Environmental Site Assessment (ESA) prepared in 2007 for the Sunnyvale Channels revealed a variety of known hazardous materials contamination sites within Sunnyvale and surrounding areas. The assessment documented residual traces of chlorinated pesticides in other channel levees and surrounding areas; detection of pesticides, PCBs, metals, and PAHs within water and sediment in the Cargill Channel (west of the West Channel) and in drainage ditches associated with the Cargill Channel and Moffett Channel; known incidents where spills involving VOCs have been reported; and generally widespread soil and groundwater contamination from trichloroethylene (TCE) in the area between Hwy 101 and SR 82 (TRC 2007). ESAs generally expire one year after preparation. The soil and groundwater contamination documented in the TRC (2007) report may have been remediated by the date of this document (2013). Since the 2007 investigation, existing contamination may also have spread to a wider area due to conveyance in the groundwater system.

Current documentation of contaminated soil and groundwater in the Project Area was reviewed for this EIR, as described in Chapter 3.7, "Hazards and Hazardous Materials." Three open, actively leaking underground fuel tanks (LUFTs) are located within 1,000 feet of the Sunnyvale Channels (SWRCB 2012). Remediation of soil and shallow groundwater contaminated by VOCs is occurring at a site located at 141 Caspian Court, adjacent to the West Channel upstream (south of) Caribbean Drive. The Sunnyvale Landfill is responsible for VOC-contaminated groundwater (SCVWD 2013a). High levels of TCE and other VOCs are present in soil and shallow groundwater due to contamination from the Middlefield Ellis Whisman and Moffett Field Superfund Sites located in Mountain View (SCVWD 2013b). While existing hazardous materials contamination has not been identified specifically within the Project Area or the Sunnyvale Channels (as shown in Figure 3.7-1), the presence of historic and existing hazardous materials in the Project vicinity indicate that previously undiscovered contaminated soil and groundwater may occur in the Project Area.

Water Discharges

As discussed in the “Environmental Setting” section above and shown in Table 3.8-5, groundwater is present within or just beneath the bed of the Sunnyvale Channels at different locations and during different times of the year. Groundwater in the Project Area is considered relatively shallow and is perched (above the channel bed) in portions of the channels during certain times of the year (see Table 3.8-5). The District proposes to dewater in-channel construction sites before commencing construction work in the channel. Dewatering generally involves first isolating the reach where in-channel construction would occur, and then pumping the isolated water out of that reach and discharging it downstream from where construction is occurring. If groundwater is directly supplying the channel (the channel bed is lower than the groundwater table), then dewatering the channel reach could result in pumping of contaminated shallow groundwater. The discharge of contaminated groundwater to downstream reaches of the Sunnyvale Channels could significantly impact water quality in the channels and downstream receiving waters. Additionally, discharge of sediment-laden water (water that contains high concentrations of suspended solids or high turbidity) could significantly impact water quality in the channels and downstream receiving waters. As discussed below, the District would implement BMPs to prevent discharges of contaminated water during construction.

Soil Discharges

Known or previously unknown contaminated soil may be present in the Project Area. Disturbance of contaminated soil during ground excavation activities may expose people and the environment to contaminants during Project construction. The potential for exposure of contaminated soil during Project construction activities is evaluated in Impact HM-1 in Chapter 3.7, “Hazards and Hazardous Materials.” Impacts on water quality would occur if contaminated soil is discharged to land, such that water could become contaminated.

Project construction activities have the potential to expose and loosen soils, leaving them susceptible to transport to surface water bodies and impacting water quality. Temporary impacts on water quality could also occur if soil is directly discharged into water bodies. For example, sediment spilled into the channel bed during bank excavation activities would constitute a direct discharge of soil into a water body. As discussed below, the District would implement BMPs to prevent discharges of soil to water bodies during construction.

Discharge of Other Water Quality Contaminants

Existing Water Quality Impairments

As discussed in the “Environmental Setting” section above, water quality of South San Francisco Bay is impaired by mercury, PCBs, and pesticides. The Proposed Project involves improving flood control and would not contribute to existing mercury, PCBs, or

pesticides contaminants to the San Francisco Bay. There would be no direct or indirect effect on implementation of established TMDLs or contributions of identified water quality impairments due to the Project. There would be no violation of TMDLs currently established for South San Francisco Bay.

Hazardous Construction Fluids

During Project construction, hazardous materials associated with construction equipment, such as oils, lubricants, fuels, or other petroleum products, would be present on-site. No hazardous materials would be intentionally applied to the ground surface for the Project. However, accidental hazardous material spills to water or the ground surface may occur. A significant impact would result if hazardous spills contaminate soil or groundwater. As discussed below, the District would implement BMPs to prevent hazardous spills during construction.

Applicable Best Management Practices

The District would implement the following BMPs to minimize water quality impacts during Project construction activities. Full text for each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP HM-9: Clean Vehicles and Equipment

BMP HM-10: Assure Proper Vehicle and Equipment Fueling

BMP HM-11: Assure Proper Vehicle and Equipment Maintenance

BMP HM-12: Assure Proper Hazardous Materials Management

BMP HM-13: Prevent Spills

BMP HM-14: Know the Spill Kit Location

BMP WQ-1: Conduct Work from Top of Bank

BMP WQ-2: Evaluate Use of Wheel and Track Mounted Vehicles in Stream Bottoms

BMP WQ-3: Assess Pump/Generator Set Operations and Maintenance

BMP WQ-4: Handle Sediments so as to Minimize Water Quality Impacts

BMP WQ-5: Avoid Runoff from Soil Stockpiles

BMP WQ-6: Stabilize Construction Entrances and Exits

BMP WQ-10: Evaluate and Select the Most Appropriate Use of Concrete Near Waterways

BMP WQ-11: Use Cofferdams for Tidal Work Areas

BMP WQ-12: Divert/Bypass Water at Non-tidal Sites

BMP WQ-15: Manage Groundwater at Work Sites

BMP WQ-16: Avoid Erosion When Restoring Flows

BMP WQ-19: Control Emergency Discharges

BMP WQ-20: Control Unplanned Discharges

BMP WQ-24: Evaluate Use of Discharge Flow Paths – Check Filters

BMP WQ-25: Evaluate Use of Discharge On-Line Filter Systems

BMP WQ-27: Evaluate Use of Discharge Surface Protection - Armoring

BMP WQ-28: Evaluate Use of Discharge Surface Protection – Flow Diversion

BMP WQ-29: Evaluate Use of Discharge Storm Drain Curb & Drop Inlet Protection

BMP WQ-40: Prevent Water Pollution

BMP WQ-41: Prevent Stormwater Pollution

Conclusions

Several Project construction activities have the potential to result in temporary changes to the water quality of the Sunnyvale Channels and Pond A4. Project construction activities have the potential to expose and loosen soils, leaving them susceptible to erosion from surface runoff and discharge into surface waters. Direct discharges of highly turbid water to the Sunnyvale Channels could also occur during channel dewatering. Contaminated soil exposed during Project construction could also be discharged into surface waters. Finally, hazardous materials commonly used with construction equipment could spill and be susceptible to discharge into surface waters.

BMPs WQ-11, WQ-12, WQ-15, and WQ-16 are channel dewatering procedures to protect water quality in tidal and non-tidal work areas.

BMPs WQ-1, WQ-2, WQ-4, WQ-5, WQ-6, WQ-19, WQ-20, WQ-24, WQ-25, WQ-27, WQ-28, WQ-29, WQ-40, and WQ-41 are measures to avoid and minimize water quality impacts due to ground disturbing activities, including handling of soil and discharges of water from the construction site.

BMPs HM-9, HM-10, HM-11, HM-12, HM-14, and HM-14 are measures to prevent against accidental discharge of hazardous materials associated with construction equipment. These measures also include procedures for proper clean up and reporting if an accidental spill occurs.

BMP WQ-10 is a measure to ensure concrete pouring activities do not impact water bodies.

The use of the above BMPs would reduce potentially significant impacts on water quality due to Project construction activities. However, these BMPs would not reduce potential water quality impacts due to handling and discharge of contaminated soil and

groundwater encountered during construction. To reduce this potentially significant impact to a less-than-significant level, the District would implement the following MM to reduce the potential for exposure and release of contaminated soil and groundwater encountered during construction.

Mitigation Measure HM-1: Conduct a Phase I and Phase II Environmental Site Assessments and Implement Site Remediation Actions Prior to Construction

Refer to Chapter 3.7 “Hazards and Hazardous Materials” Impact HM-1 for the full text of this MM.

The implementation of MM HM-1 would identify of the extent of existing contaminated soil and groundwater and implement measures in accordance with regulatory procedures to ensure Project construction activities would protect the environment and prevent against threats to public health and safety. With the implementation of this MM, potential impacts on water quality would be reduced to a less-than-significant level.

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Chapter 3.9

Land Use and Planning

3.9.1 Introduction

This chapter summarizes the potential impacts on land use and planning from Project construction and property acquisitions. Included is a description of the regulatory setting and affected environment related to land use. Where feasible, mitigation measures are identified to reduce the level of expected impacts.

3.9.2 Regulatory Setting

Federal Regulations

No specific federal regulations related to land use are applicable to the Proposed Project.

State Regulations

California Streets and Highways Code Section 660

Pursuant to California Streets and Highways Code Section 660, an encroachment permit must be obtained for all proposed activities related to the placement of encroachments within, under, or over the state highway rights-of-way (DOT 2010). Caltrans is the steward of California's state highways, and acts to protect the California highway system. The primary concern of Caltrans is the safety of the traveling public and permittees on California highway rights-of-way. Caltrans cooperates with other public agencies and with private parties to promote the safe use of state highways.

Some examples of work requiring an encroachment permit are utilities, excavations, encroachment renewals, advertisements, vegetation planting or trimming, surveys, mail boxes, driveways, installation or removal of tire chains for compensation, special events, and commercial filming activities. An "encroachment" is defined in Section 660 as "any tower, pole, pole line, pipe, pipeline, fence, billboard, stand or building, or any structure, object of any kind or character not particularly mentioned in the section, or special event, which is in, under, or over any portion of the state highway rights of way." A Caltrans Encroachment Permit would be required for any activities of the Proposed Project on roadways/right-of-ways that are maintained/owned by Caltrans.

Local

City of Sunnyvale General Plan

The *Sunnyvale General Plan* (City of Sunnyvale 2011) provides a long-range comprehensive plan to govern growth and development within the City of Sunnyvale. The City of Sunnyvale's (City's) General Plan contains a land use element that designates the proposed general distribution, location, and extent of the uses of land for housing, business, industry, recreation, education, government, and other categories of public and private uses of land. The safety and noise element ensures that knowledge of existing natural and human-made hazards are considered in all land use planning. The following policies contained in the General Plan's Land Use and Transportation and Safety and Noise elements are relevant to the Proposed Project:

Land Use and Transportation

Policy LT-8.4: Maintain existing park and open space tree inventory through the replacement of trees with an equal or greater number of trees when trees are removed due to disease, park development or other reasons.

Safety and Noise

Policy SN-1.2: Take Measures to Protect Life and Property from the Effects of a One Percent Flood

City of Sunnyvale Municipal Code

Section 13.08.030: Encroachment Permit

The purpose of the City's Encroachment Permit (Municipal Code Section 13.08.030) is to protect the public through procedures and regulations for the granting of permits to allow encroachments in the public right-of-way. The District will seek both permanent and temporary encroachment permits for several public rights-of-way (ROWs) for the Proposed Project. "Encroach" or "encroachment" includes going upon, over, or under an ROW, or using an ROW or an area adjacent to an ROW in such a manner as to prevent, obstruct, or interfere with the intended use of that way, or a modification of its mode of use, including but not limited to excavation or disturbance; erection, construction, placement, or maintenance of any physical improvement; planting or maintaining any landscaping; or placement or maintenance of any waste material, except the placement of solid waste or recyclables in authorized receptacles for pick-up in accordance with City of Sunnyvale Municipal Code, Chapter 8.16.

Section 13.16: City Trees Policy

Sunnyvale's City Tree Ordinance (Municipal Code Section 13.16) protects trees greater than 4 inches diameter and 4.5 feet tall, and growing within the public ROW (land dedicated to public use for street, utility, or highway purposes, or other transportation purposes). This ordinance mandates permit requirements for the planting or disturbance of any City tree. City tree means any woody plant that is growing within the public ROW along a City street and has a trunk 4 inches or more in diameter at 4.5 feet

above normal ground level. The permit shall be issued when the superintendent determines that the required work is necessary and that the proposed method is in accordance with generally accepted arboricultural specifications and standards of practice. Additionally, Municipal Code 13.16.060 establishes permit procedures for the excavation, placement of fill, compaction of soil, or construction of any structure, walkway, driveway, pavement or public utility within 15 feet of any City tree.

Applications for permits must be made at least 48 hours in advance of the time the work is to be started. The application shall contain, but shall not be limited to, the following:

- The number of trees to be planted or set out, the location, grade, size, quality, species, cultivar or variety of each tree, the method of planting, and such other information as the superintendent may require;
- The number and kinds of trees to be sprayed, fertilized, trimmed/pruned, removed, relocated or otherwise preserved, the kind of treatment to be administered, the composition of the spray or fertilizer material to be applied, and such other information as the superintendent may require;
- The written agreement of each applicant for a permit that the applicant will comply with the requirements, regulations and standards of Municipal Code 13.16;
- The time schedule for the proposed work; and
- Such other information as the superintendent deems necessary.

Moffett Park Specific Plan

The Sunnyvale Channels north of State Route (SR) 237 are within the area designated as Moffett Park—an area practically in the middle of Silicon Valley. The western boundary of Moffett Park abuts Moffett Federal Airfield. The northern boundary is along the City's Landfill and the Sunnyvale Materials Recovery and Transfer Station (SMaRT). SR 237 constitutes the southern boundary and the Sunnyvale Baylands Park forms the eastern boundary.

The focus of the *Moffett Park Specific Plan* (City of Sunnyvale 2004) is to recognize the area as the primary location of new Class A office development. The average parcel size in Moffett Park is greater than any other industrial area of the City, and there are no nearby residential areas to cause land use conflicts in terms of height, floor area ratio, use of hazardous materials, or other industrial operational issues. Since the late 1990s, several high-technology corporations (e.g., Yahoo, Juniper Networks, Network Appliance, Ariba/Interwoven) have been located in Moffett Park. The City has identified the area as a unique resource to support its goal of expanding its share of headquarters and major office and research facilities of emerging high technology companies. It is the

City's goal to maximize Moffett Park development with corporate headquarters, office, and research/development facilities of high technology companies.

San Francisco Bay Conservation and Development Commission

Under the McAteer-Petris Act of 1965 and the San Francisco Bay Plan (Bay Plan), San Francisco Bay Conservation and Development Commission (BCDC) has jurisdiction over all tidal areas of San Francisco Bay and a shoreline that extends 100 feet inland of the mean high tide. In wetlands, BCDC's jurisdiction extends up to 5 feet above mean sea level. Any filling, excavation of material or substantial change in use within the BCDC jurisdiction requires a permit from BCDC.

BCDC's Bay Plan (BCDC 2011) addresses preservation of San Francisco Bay (Bay) and protection of its natural resources. The following policies of the Bay Plan related to shoreline protection are relevant to the Proposed Project:

- New shoreline protection projects and the maintenance or reconstruction of existing projects and uses should be authorized if: (a) the project is necessary to provide flood or erosion protection for existing development, use or infrastructure or proposed development, use or infrastructure that is consistent with other Bay Plan policies; (b) the type of the protective structure is appropriate for the project site, the uses to be protected, and the erosion and flooding conditions at the site; (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; (d) the project is properly designed and constructed to prevent significant impediments to physical and visual public access; and (e) the protection is integrated with current or planned adjacent shoreline protection measures. Professionals knowledgeable of the Commission's concerns, such as civil engineers experienced in coastal processes, should participate in the design.
- Riprap revetments, the most common shoreline protective structure, should be constructed of properly sized and placed material that meet sound engineering criteria for durability, density, and porosity. Armor materials used in the revetment should be placed according to accepted engineering practice, and be free of extraneous material, such as debris and reinforcing steel. Generally, only engineered quarystone or concrete pieces that have either been specially cast, are free of extraneous materials from demolition debris, and are carefully selected for size, density, and durability will meet these requirements. Riprap revetments constructed out of other debris materials should not be authorized.
- Authorized protective projects should be regularly maintained according to a long-term maintenance program to assure that the shoreline will be protected from tidal erosion and flooding and that the effects of the shoreline protection

project on natural resources during the life of the project will be the minimum necessary.

- Whenever feasible and appropriate, shoreline protection projects should include provisions for nonstructural methods such as marsh vegetation and integrate shoreline protection and Bay ecosystem enhancement, using adaptive management. Along shorelines that support marsh vegetation, or where marsh establishment has a reasonable chance of success, the Commission should require that the design of authorized protection projects include provisions for establishing marsh and transitional upland vegetation as part of the protective structure, wherever feasible.
- Adverse impacts to natural resources and public access from new shoreline protection should be avoided. Where significant impacts cannot be avoided, mitigation or alternative public access should be provided.

The District is obtaining a shoreline development permit from BCDC as part of the Proposed Project.

3.9.3 Environmental Setting

Land Uses Surrounding Project Channels

The Sunnyvale Channels traverse primarily urban areas of Sunnyvale (refer to Figure 2-1 in Chapter 2, "Project Description"). Sunnyvale is highly developed, and the only foreseeable land use changes include a trend toward more multi-unit residential and commercial mixed uses of areas that are currently mostly under-utilized industrial, to further the City's goals for improved balance between jobs, housing, and goods and services (City of Sunnyvale 2011).

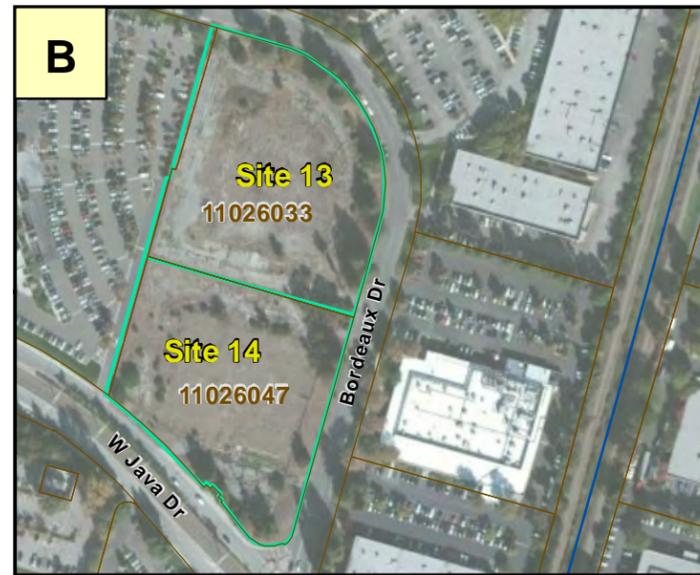
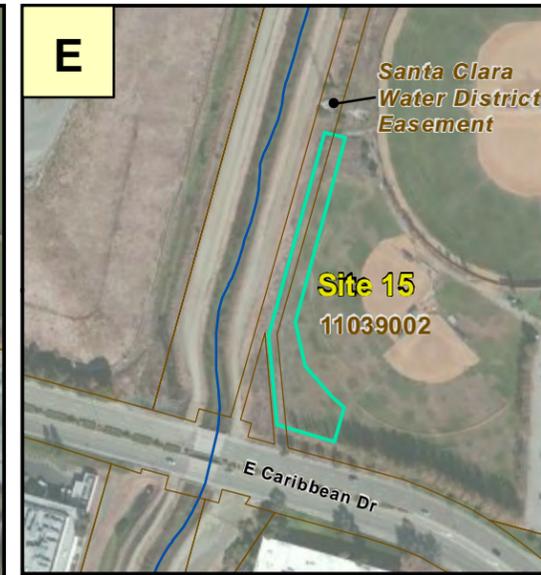
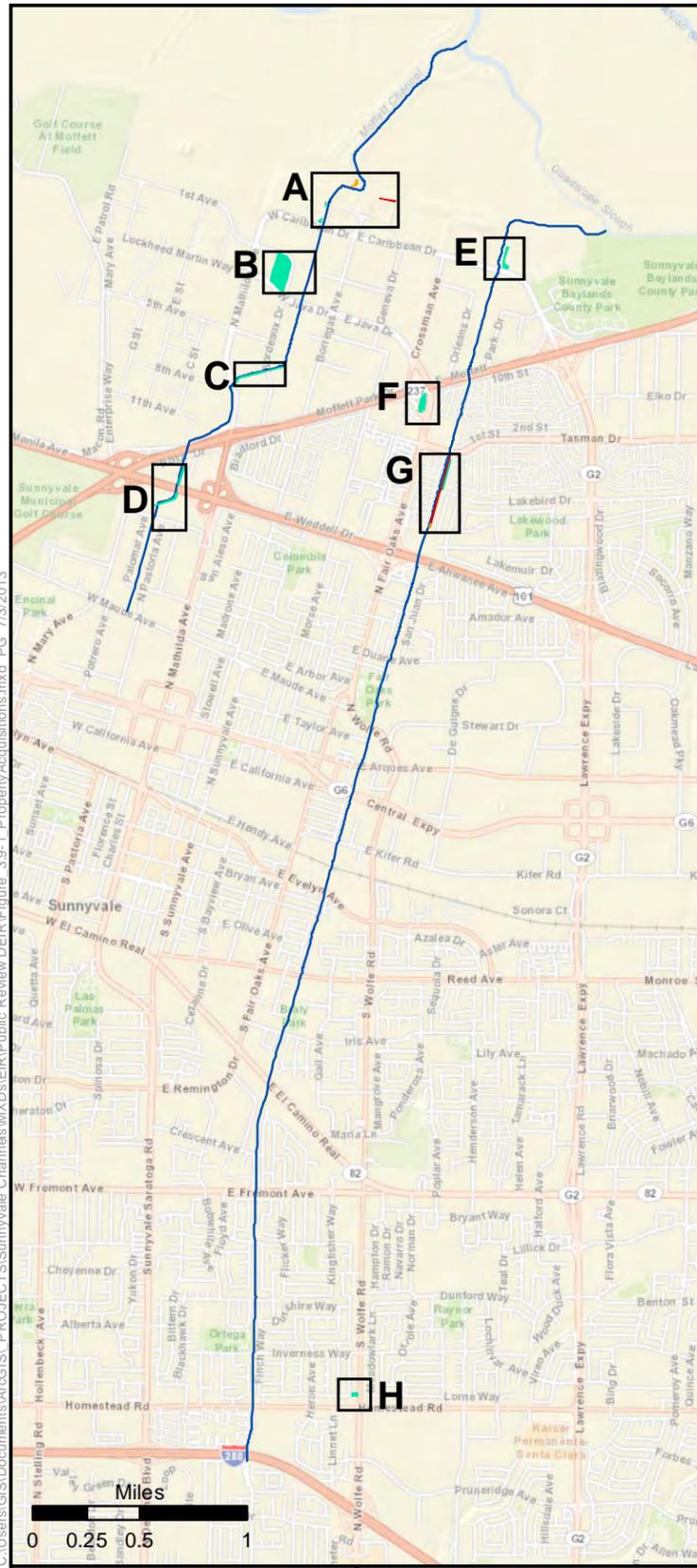
The Sunnyvale Channels drain in a northerly direction to Guadalupe Slough, which surrounds Pond A4. The furthest downstream portions of the Sunnyvale Channels are surrounded by a variety of land uses, including recreational trails, parks, and public solid waste and water pollution facilities. Slightly further upstream, the surrounding land uses are mostly industrial. Upstream portions of the Sunnyvale Channels are surrounded primarily by residential areas consisting of mobile home parks, apartment buildings, and single-family homes. Land uses immediately surrounding each of the channels and Guadalupe Slough/Pond A4 are described in more detail below.

The Sunnyvale Channels are primarily open-water conveyances, but are also intermittently routed underground through culverts. In most areas of the channels, there is a 10–20-foot easement on each side of the channel and fencing buffering the channels from adjacent land uses. The easements contain either approximately 15-foot-wide maintenance roads to access the channels, which are located on either or both sides of the channel, or remain as undeveloped land. There are a number of Pacific Gas and Electric Company (PG&E) towers located in the project rights of way. A number of highways and local roads cross the channels. Below are descriptions of major roadways that cross the Sunnyvale Channels:

- California SR 237 (Southbay Freeway) connects the East Bay to the Peninsula. It runs from El Camino Real in Mountain View to Interstate (I-) 680 in Milpitas. SR 237 is maintained by Caltrans.
- U.S. Highway (Hwy) 101 (Bayshore Freeway) is a major north-south route through much of California, from Los Angeles to the southern border of Oregon. It varies in width along its route. In the Project Area, it is three lanes in each direction. It is also part of the Juan Bautista de Anza National Historic Trail auto tour route in the Project Area (see Chapter 3.11, “Recreation,” for more details). Hwy 101 is maintained by Caltrans.
- California SR 82 (El Camino Real) connects Hwy 101 in San José to I-280 in San Francisco. SR 82 is maintained by Caltrans. In the Project vicinity, it serves as a local arterial roadway.
- Central Expressway (County Route G6) runs through Silicon Valley, between San José and Palo Alto. For most of its route, it is a major four-lane surface street. As it crosses through the City of Sunnyvale, it takes on a freeway-like appearance. In the Project vicinity, the Central Expressway has a wide center divider and separated grade interchanges with main cross streets and no turnoffs or driveways. It is part of the Santa Clara County Expressway System.

Construction of the Proposed Project would be limited to the Project Area, which includes the District’s existing ROW/easements, the channels themselves, and property acquired permanently and temporarily for the Project. Currently, the District does not have adequate ROW to accommodate all of the proposed floodwalls. The District would acquire temporary construction easements (TCEs) from several parcels as staging areas for the temporary storage of construction equipment and materials. The District would also acquire permanent easements from several parcels where floodwalls would be permanently located. These permanent easements are needed for the District to maintain floodwalls after construction. Each of the parcels that would be acquired by the District for ROW is described below. **Figure 3.9-1** shows the location of proposed permanent and temporary land acquisitions.

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Parcel Acquisitions

- Acquire Easement
- Acquire Fee
- Temporary Construction Easements/Staging Areas
- Parcel Boundaries

Feet

500 250 0

scale applies to lettered frames only



Sources: SCVWD 2012; ESRI

Prepared for:
Santa Clara Valley Water District
October 2013



Figure 3.9-1
Permanent and Temporary
Property Acquisitions

Sunnyvale East and West
Channel Flood Protection Project

Sunnyvale East Channel

The East Channel trends generally in a north-south direction from the Bay, just north of East Caribbean Drive and south to I-280. Project work locations along the East Channel are not located farther south than Inverness Way. Similar to the West Channel at its northern terminus, the channel parallels the Bay Trail and open space and is commonly used for recreation. Further south, commercial and vacant land uses are located north of SR 237 and between East Evelyn Avenue and North Wolfe Road. Between East Evelyn Avenue and East Caribbean Drive, residential units generally trend toward multi-family units. Properties adjacent to the southern portion of the East Channel, from I-280 to about East Evelyn Avenue, are primarily single-family residential units with a few commercial properties near Homestead Road and El Camino Real crossings. The East Channel runs adjacent to five parks (Ortega Park, Braly Park, Fair Oaks Park, Baylands Park, and the Twin Creeks Sports Complex), the John W. Christian Greenbelt, and two schools (Braly Elementary and the King's Academy).

Table 3.9-1 identifies details of each of the parcels the District proposes for acquisition along the East Channel, including the current property owner, City of Sunnyvale Land Use designation, and observed land use of the area proposed for acquisition. The majority of the acquisitions are small portions of parcels (see Figure 3.9-1). Two parcels will be obtained for permanent ROW between Tasman Drive and Hwy 101 on the east bank for an outboard floodwall. Four TCEs are required along the East Channel for staging for the duration of Project construction.

Sunnyvale West Channel

The West Channel trends generally in a north-south direction, from just north of Caribbean Drive and south to Hwy 101. Adjacent to the San Francisco Bay Trail (Bay Trail) and open space, recreational activities are common along this portion of the channel, including hiking, jogging, walking, and bicycling. Further discussion of recreational uses in the Project Area is provided in Section 3.11, "Recreation." The City of Sunnyvale SMaRT facility (recycling and solid waste transfer station) and Water Pollution Control Plant (WPCP) are located adjacent to the channel, south of Pond A4 and north of Caribbean Drive. Other land uses in the West Channel vicinity are predominantly commercial and industrial in nature. Most of the buildings are set back some distance from the channels; many of the parking areas for the buildings are directly adjacent to the channel easements. A few parcels are vacant and/or undergoing redevelopment.

Table 3.9-1 identifies details of each of the parcels the District proposes for acquisition along the West Channel, including the current property owner, City of Sunnyvale Land Use designation, and observed land use of the area proposed for acquisition. Similar to the East Channel, the majority of the acquisitions represent small portions of the entire parcels (also see Figure 3.9-1). The Proposed Project requires the acquisition of two permanent easements for floodwalls along the West Channel. Nine TCEs along the

West Channel are also necessary for construction of the Project. TCE use would range from 3 to 30 months.

Guadalupe Slough/Pond A4

Pond A4 is located beyond the northern terminus of the Project Area, just north of the SMaRT facility, WPCP, and the Twin Creek Sports Complex. Pond A4 is a former salt production pond that was purchased by the District in 2000. The Guadalupe Slough flows around its northern and eastern sides. Public access is permitted along the entire perimeter of Pond A4 via an earthen recreation pathway along its raised levee banks. This trail is popular for recreational activities, such as bird watching, walking, jogging, or bicycling. A portion of the Bay Trail is located along the southern and west levees of Pond A4, providing direct non-motorized access to and from the pond.

Table 3.9-1. Project Property Acquisitions Adjacent to the Sunnyvale West Channel

Figure ID ¹	Parcel Number (APN)	Current Property Owner	Observed Current Land Use	City of Sunnyvale General Plan Land Use Designation	Acreage Acquired	Duration of Acquisition
Sunnyvale East Channel						
<i>Permanent Property Acquisitions</i>						
10	11015064	City of Sunnyvale	Undeveloped land between maintenance road and homes	Low Density Residential (0-7 du/ac)	0.59	Permanent
11	11015019	Pacific Gas & Electric	Undeveloped paved land on the edge of PG&E substation property	Industry	0.04	Permanent
<i>Temporary Property Acquisitions</i>						
12	11015064	City of Sunnyvale	Undeveloped land between maintenance road and homes	Low Density Residential (0-7 du/ac)	0.87	30 months
15	11039002	County of Santa Clara	Undeveloped land contiguous to recreational baseball fields	Environmental Services	0.74	30 months
16	30951001	City of Sunnyvale	Undeveloped, previously disturbed lot	Neighborhood Commercial	0.25	30 months
17	11029035	City of Sunnyvale	Undeveloped, previously disturbed lot	Industry	1.29	30 months
Sunnyvale West Channel						
<i>Permanent Property Acquisitions</i>						
1	11003064	City of Sunnyvale	San Francisco Bay Trail	Environmental Services	0.13	Permanent
2	01535049	Leslie Salt Company	San Francisco Bay Trail	Environmental Services	0.22	Permanent
<i>Temporary Property Acquisitions</i>						
3	11002070	City of Sunnyvale	Existing maintenance road on the border of the City's Landfill	Environmental Services	0.07	3 months
4	11002070	City of Sunnyvale	Existing maintenance road on the border of the City's Landfill	Environmental Services	0.11	3 months
5	11035009	Bordeaux-Borregas Campus, LLC	On the border of a private parking lot	Moffett Park	0.15	6 months
6	11027023	Mathilda Ave Campus, LLC	On the border of a private parking lot	Moffett Park	0.27	6 months

Figure ID ¹	Parcel Number (APN)	Current Property Owner	Observed Current Land Use	City of Sunnyvale General Plan Land Use Designation	Acreage Acquired	Duration of Acquisition
7	11027032	Mathilda Ave Campus, LLC	On the border of a parking lot	Moffett Park	0.11	6 months
8	11007022	City & County of San Francisco	Undeveloped, previously disturbed lot	Industry	0.44	3 months
9	16544008	City & County of San Francisco	On border of parking lot	Industry	0.61	6 months
13	11026033	Yahoo Inc.	Undeveloped, previously disturbed lot	Moffett Park	3.29	30 months
14	11026047	Yahoo Inc.	Undeveloped, previously disturbed lot	Moffett Park	3.58	30 months

Notes: du/ac = dwelling units per acre

¹ Refers to the reference number of the property acquisition on Figure 3.9-1.

Source: SCVWD 2010.

3.9.4 Impact Analysis

Criteria for Determining Significance

The Proposed Project would be considered to have a significant impact if it would:

- a) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the policies of the general plan, specific plan, or zoning ordinance) adopted to protect environmental resources; or
- b) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

Methodology

This section describes the impacts to land use associated with the implementation of the Proposed Project. The analysis of land use and planning is generally qualitative, and includes consideration of applicable land use policies, plans, and programs, such as land use policies in the Sunnyvale General Plan (City of Sunnyvale 2011) and ordinances in the Municipal Code. Conflicts with land use policies would occur if the Proposed Project were to alter land use of adjacent areas temporarily during construction or permanently through the acquisition of ROW, in such a matter that is not compatible with the existing or designated uses of these lands. Plans for the construction and design of the Proposed Project (Figures 2-3a through 2-3g) were compared to information about existing land use for analysis of potential impacts.

Project maintenance would occur as needed and may require maintenance activities, such as sediment removal and vegetation management, from within the Sunnyvale Channels, which could impact land use. Potential impacts due to stream maintenance activities are addressed by the District's Stream Maintenance Program Subsequent EIR (refer to Chapter 2.0, "Project Description"). The Stream Maintenance Program Final Subsequent EIR is available for review online: <http://valleywater.org/SMPSEIR2011.aspx>. See Volume 2, Chapter 3, Section 3.8 for the Land Use and Planning impact discussion.

Environmental Impacts

The impact discussions below are structured as follows. First, the environmental impacts of the Proposed Project in the absence of best management practices (BMPs) are discussed. The discussion then presents applicable District BMPs that would avoid or minimize the level of impact. A conclusion regarding the significance of the environmental impact is then made (considering implementation of the District BMPs, as

applicable). If the impact would be significant even with use of BMPs, mitigation measures (MMs) are prescribed. The residual significance of each impact following application of the MMs is then provided.

Impact LU-1: Project Property Acquisitions Conflicts with Applicable Land Use Plans or Policies – Less than Significant

The District would acquire permanent property acquisitions along the Sunnyvale Channels for ongoing maintenance of floodwalls developed on these lands. The District would also acquire TCE for staging areas where construction equipment and soils would be temporarily stored during construction (Figure 3.9-1 and Table 3.9-1). Potential conflicts resulting from each property acquisition proposed for the Project are discussed below. Specific easements are referred to by the Figure ID presented in the Table 3.9-1 and Figure 3.9-1. Potential conflicts associated with construction on state highways are also discussed below.

Permanent Easements

Sunnyvale East Channel

Two parcels would be obtained for permanent ROW between Tasman Drive and Hwy 101 on the east bank for an outboard floodwall. Easement 10 is situated closely between the East Channel and several single-family homes, and is designed for residential use by the City's General Plan. Easement 11 is part of the PG&E substation and next to the John W. Christian Greenbelt, and is designated for industrial use by the City's General Plan. The acquired portions of these parcels are confined to the channel easements, located between channel maintenance roads and adjacent residential and industrial areas. The District would construct an outboard floodwall within these easements. After construction, the District would use the acquired ROW to conduct maintenance on floodwall structures and the maintenance road, as necessary. None of these activities would conflict with the use of these properties designated in the City's General Plan.

Sunnyvale West Channel

The Proposed Project requires the acquisition of two permanent easements for floodwalls along the West Channel. Easement 1 is located on City property, and Easement 2 is located on property owned by Leslie Salt Company. Both properties are located near the downstream confluence of the West Channel and Guadalupe Slough, adjacent to Pond A4, and consist of a maintenance road/levee that serves as a portion of the Bay Trail. In the acquired parcels, floodwalls would be developed by the Project along the top edge of the existing maintenance roads (refer to Figure 2-3a in Chapter 2, "Project Description"). Additionally, in Easement 1, the existing levee road would be raised and an earthen levee ramp would be installed (Figure 2-3a). After the Project, the District would use the existing maintenance levee road to conduct maintenance on floodwall structures, as necessary. The District already uses these roads/levees on these parcels to gain access to other reaches of the Sunnyvale Channels. Therefore,

with development of the Project, existing use of the roads/levees as the Bay Trail for recreational purposes would easily continue.

Temporary Construction Easements

Sunnyvale East Channel

Four TCEs are required along the East Channel for staging for the 30-month duration of Project construction. Each of the TCEs is currently located on undeveloped lands. TCE 15 is on the edge of a baseball field in Baylands Park, a County-owned and City-managed recreational facility that is adjacent to the East Channel north of Caribbean Drive. TCEs 12, 16, and 17 are a part of properties owned by the City. TCE 12 is an empty area between the channel easement and several single-family homes and is designated for use as low-density residential housing by the City's General Plan. TCEs 16 and 17 are empty undeveloped lots located nearby (not directly adjacent to) the East Channel. TCE 16 is located in an area designated for commercial use within a residential neighborhood and TCE 17 in a small industrial area adjacent to SR 237.

After Project construction, each of the TCEs would be returned to their existing condition. Because each TCE for the East Channel is currently empty and undeveloped, no existing uses would be affected by use of these areas for construction staging. Furthermore, use of these areas for construction staging would not prohibit future use of these lands as designated by the City's General Plan.

Sunnyvale West Channel

Nine TCEs along the West Channel are also necessary for construction of the Project. TCE use would range from 3 to 30 months for the West Channel. TCEs 3 and 4 are necessary for levee ramp construction along the west bank of the West Channel, between Caribbean Drive and Carl Road. These TCEs are part of the City of Sunnyvale's property that is currently used as an access road to the City's landfill. Impacts on the City's use of this road during construction of the reach extending from Carl Road to Caribbean Drive are discussed under Impact UTL-3 in Section 3.13, "Utilities and Service Systems." After development of the Project, the only difference would be that the existing roads in the TCEs would have been converted into levee ramps for access on to and off of the enlarged levee along this reach. Therefore, after development of the Project, the roads would continue to be used by the City as currently occurs.

TCEs 5 to 9 are necessary for construction at specific locations along the West Channel. Each of these TCEs would be used by the District for between 3 and 6 months. TCE 5 is a small portion of a parking lot owned by Bordeaux-Borregas Campus, LLC property. TCEs 6 and 7 are small portions of business parking lot owned by Mathilda Ave Campus, LLC. TCE 8 is a currently undeveloped parcel located south of Ross Drive and north of Hwy 101. TCE 9 is currently used for parking, directly south of Hwy 101. TCEs 8 and 9 are parts of property owned by the City and County of San Francisco. During construction of the Project, existing use of parking lots within the area of the TCEs would not be possible/permitted. Impacts on parking capacity are addressed in Impact TR-4 in

Chapter 3.12, "Traffic and Transportation." After development of the Project, the use of the parking lots for parking would resume, as currently occurs.

TCEs 13 and 14 are needed for general staging for the duration of Project construction. These sites, which are the largest of the proposed easements, are empty and undeveloped lots owned by Yahoo. TCEs 13 and 14 are not directly adjacent to the West Channel, but located nearby. These TCEs are in the area designated as Moffett Park by the City's General Plan. After Project construction, TCEs 13 and 14 would be returned to their existing condition. Because these TCEs are currently empty and undeveloped, no existing uses would be affected by use of these areas for construction staging. Furthermore, use of these areas for construction staging would not prohibit future use of these lands as designated by the City's General Plan and the Moffett Park Specific Plan.

Construction on State Highways

The Project proposes to raise a headwall on both the upstream and downstream face of the SR 237 crossing with the East Channel. Construction would primarily occur within the highway shoulder. Lane closures would not be typical during construction of this component but could be required for concrete pouring, at most, for three nights between 9 p.m. and 4 a.m. As part of the Project, the District would obtain an encroachment permit from Caltrans to ensure that Project construction activities do not conflict with the public's existing use and Caltrans' existing operations of this highway.

Applicable District BMPs

No District BMPs are applicable to this impact.

Conclusion

The Project is not expected to result in conflicts with any other properties permanently and temporarily acquired by the District. As part of the Project, the District has committed to obtaining encroachment permits from the City of Sunnyvale, Santa Clara County, the City and County of San Francisco and Caltrans. With these permits, the District would be in compliance with the plans and regulations of these municipalities and Caltrans for acquisition of their properties. For these reasons, this impact is considered less than significant.

Impact LU-2: Project Tree Removal Conflicts with Applicable Land Use Plans or Policies – Less than Significant

Sunnyvale Municipal Code Section 13.16 establishes the protection of trees on City of Sunnyvale public ROW. For trees that meet the criteria defined in the Sunnyvale Municipal Code,, a tree removal permit is required when removing, trimming, pruning, spraying, fertilizing, cutting above ground, or otherwise disturbing any City tree. Trees protected by the City ordinance include any woody plant which is growing within the public right-of-way along a City street and has a trunk 4 inches or more in diameter at

4.5 feet above normal ground level. Additionally, the City's General Plan includes General Plan Policy LT. 8.4, which requires that trees removed from City of Sunnyvale public ROW are replaced at an equal or greater ratio. Numerous trees are planned for removal during Project construction, as shown in **Table 3.9-2**. In addition, trimming, pruning, and cutting of other trees may be necessary, and additional trees may need to be removed during Project construction. It is anticipated that all or most trees removed or otherwise affected by the Project would be located within the District's ROW or easements obtained as part of the Project. Removal of trees from District ROW is not subject to the City's tree removal policy. However, the Project could possibly remove trees from Sunnyvale's public ROW, and in this case the Project has the potential to conflict with adopted protective measures if tree removal. The District would comply with the City's tree removal policy by planting and ensuring the establishment of at least one tree for each protected tree removed from the City's ROW. The biological impacts of tree removal are discussed in Chapter 3.3, "Biological Resources."

Table 3.9-2. Trees Proposed for Removal during Project Construction

Project Area Location	City Trees Planned for Removal ¹
Sunnyvale East Channel	
Northwest of the Tasman Drive channel crossing	1
South of Tasman Drive channel crossing	6
North of East Duane Avenue channel crossing	33
Sunnyvale West Channel	
North of the West Java Drive channel crossing	15
Between West Java Drive and Bordeaux Drive	10
South of the Ross Drive channel crossing	4
<i>Total</i>	69

Note: ¹ City trees are those greater than 4 inches diameter at 4.5 feet above the ground level.

Applicable District BMPs

No District BMPs are applicable to this impact.

Conclusion

The District would comply with Sunnyvale's tree ordinance and replacement policy for trees that are required to be removed from the City's ROW. This practice would ensure that the District obtains permits as required by Municipal Code 13.16 (see Section 3.9.2, "Regulatory Settings," above). Therefore, this impact is considered less than significant.

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Chapter 3.10

Noise and Vibration

3.10.1 Introduction

This chapter summarizes the potential noise and vibration impacts related to implementation of the Project. This chapter includes a review of the existing noise environment (setting) of the Project Area, a summary of policies and regulations related to noise and vibration that are applicable to the Project, and an analysis of noise and vibration impacts resulting from construction of the Project. Outside of the construction of the Project, no new operational noise or vibration sources would be generated by the Proposed Project. Where feasible, mitigation measures are identified to reduce the level of expected impacts associated with construction of the Project. A brief introduction of noise and vibration concepts and terminology used in this assessment is provided below.

Terminology

The terminology below is commonly used in describing and evaluating noise and vibration. Typical A-weighted noise levels (defined below) for various types of sound sources are summarized in **Table 3.10-1**.

- **Sound.** A vibratory disturbance transmitted by pressure waves through a medium such as air and capable of being detected by a receiving mechanism, such as the human ear or a microphone.
- **Noise.** Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
- **Decibel (dB).** A measure of sound based on a logarithmic scale that indicates the squared ratio of actual sound pressure level to a reference sound pressure level (20 micropascals).
- **A-Weighted Decibel (dBA).** A measure of sound that is weighted to take into account the varying sensitivity of the human ear to different frequencies of sound. The dBA scale is the most widely used for environmental noise assessments.
- **Maximum Sound Levels (L_{max}).** The maximum (L_{max}) sound levels measured during a monitoring period.
- **Equivalent Sound Level (L_{eq}).** L_{eq} represents an average of the sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level that would contain the same acoustical energy as the time-varying sound that actually occurs during the monitoring period. The 1-hour A-weighted equivalent sound level (L_{eq} 1h) is the energy average of A-weighted sound levels occurring during a 1-hour period.

- **Day-Night Level (L_{dn}).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with a 10-dB penalty added to sound levels between 10:00 p.m. and 7:00 a.m.
- **Community Noise Equivalent Level (CNEL).** Similar to L_{dn}, this noise descriptor adds an additional 5-dB penalty to sound levels between 7:00 p.m. and 10:00 p.m.
- **Vibration Velocity Level (or Vibration Decibel Level, VdB).** The root mean square velocity amplitude for measured ground motion expressed in dB.
- **Peak Particle Velocity (PPV).** A measurement of ground vibration defined as the maximum speed at which a particle in the ground is moving, expressed in inches per second (in/sec).

Table 3.10-1. Typical A-Weighted Sound Levels

Sound Level (dBA)	Common Outdoor Activities	Common Indoor Activities
110		Rock band
105	Jet flyover at 1,000 feet	
100		
95	Gas lawnmower at 3 feet	
90		
85	Diesel truck at 50 mph at 50 feet	Food blender at 3 feet
80		Garbage disposal at 3 feet
75	Noisy urban area, daytime	
70	Gas lawnmower at 100 feet	Vacuum cleaner at 3 feet
65	Commercial area	Normal speech at 3 feet
60	Heavy traffic at 300 feet	
55		Large business office
50	Quiet urban area, daytime	Dishwasher in next room
45		
40	Quiet urban area, nighttime	Theater, large conference room (background)
35	Quiet suburban area, nighttime	
30		Library
25	Quiet rural area, nighttime	Bedroom at night, concert hall (background)
20	Rustling of leaves	
15		Broadcast/recording studio

Notes: dBA = A-weighted decibel

Source: Caltrans 2009.

Overview of Sound and Noise

Sound from multiple sources operating in the same area, such as from multiple pieces of construction equipment, will result in a combined sound level that is greater than any individual source. The combined noise level of multiple sources is not equivalent to the sum of individual sound levels for different noise sources. Rather, the combined noise level produced by multiple noise sources is calculated using logarithmic summation. For example, if one bulldozer produces a noise level of 80 dBA, then two bulldozers operating side by side would generate a combined noise level of 83 dBA (only 3 dBA louder than the single bulldozer).

Human sound perception, in general, is such that a change in sound level of 3 dB is just noticeable; a change of 5 dB is clearly noticeable; and a change of 10 dB is perceived as doubling or halving the sound level. A doubling of actual sound energy is required to result in a 3 dB (i.e., barely noticeable) increase in noise; in practice, for example, this means that the volume of traffic on a roadway typically needs to double to result in a noticeable increase in noise.

Sound perception also depends on whether a new sound is similar to existing sounds in an area. Most people cannot detect differences of 1 to 2 dB between noise levels of a similar nature (for example, a 1-dB increase in traffic noise compared with existing traffic noise). However, under ideal listening conditions, some people can detect differences of 2 or 3 dB, and most people under normal listening conditions would probably perceive a 5 dB change in sounds of a similar nature. When a new, intruding sound is of a different nature than the background sound (e.g., a car alarm compared with quiet residential sounds), most people can detect changes as small as 1 dBA.

When distance is the only factor considered, sound levels from isolated point sources of noise typically decrease by about 6 dB for every doubling of distance from the noise source. When the noise source is a continuous line, such as vehicle traffic on a highway, sound levels decrease by about 3 dB for every doubling of distance. Noise levels can also be affected by several factors other than the distance from the noise source. Topographic features and structural barriers that absorb, reflect, or scatter sound waves can affect the reduction of noise levels over distance. Atmospheric conditions (wind speed and direction, humidity levels, and temperatures), as well as the presence of dense vegetation, can also affect the degree of sound attenuation. Normally, the presence of acoustically absorptive ground, such as grass, will increase the rate of attenuation by about 1.5 dB per doubling of distance. Thus, where absorptive ground is present, the attenuation rate for a point source will increase to about 7.5 dB per doubling of distance and the rate for a line source will increase to about 4.5 dB per doubling of distance.

Overview of Vibration

In addition to generating noise, traffic and heavy construction equipment can generate groundborne vibration. The effects of groundborne vibration include perceptible movement of the building floors and walls, rattling of windows, and rumbling sounds. The overall effect of vibration caused by construction activities is generally limited only to people living close to the vibration sources. Building damage can also occur but only at exceptionally high vibration levels not commonly encountered except for vibration-sensitive structures very close to large vibration sources.

The average ground velocity of the vibratory motion generally determines the amount of vibration caused by transit projects and construction activities, such as blasting, pile driving, vibratory compaction, demolition, and drilling or excavation. Groundborne vibrations related to human annoyance are generally expressed as the root mean square of VdB. However, a major concern with regard to construction vibration is building damage. Consequently, construction vibration is generally assessed in terms of PPV, measured in inches per second (FTA 2006).

Table 3.10-2 summarizes typical groundborne vibration levels and the associated average human response to vibration that may be anticipated when a person is at rest in quiet surroundings. If the person is engaged in any type of physical activity, vibration tolerance increases considerably. Vibration can be felt or heard well below the levels that produce any damage to structures. The duration of the vibratory event has an effect on human response, as does its daily frequency of occurrence. Generally, as the duration and frequency of occurrence increase, the potential for adverse human response also increases.

Table 3.10-2. Typical Levels of Groundborne Vibration

Vibration Sound Level (VdB)	Typical Sources	Human or Structural Response
100	Blasting from construction project, 50 feet away	Cosmetic damage to fragile buildings
90	Bulldozer, 50 feet away	Difficulty in reading computer screen
80	Railroad train, 50 feet away	Threshold for residential annoyance for occasional events
65	Bus or truck on public road, 50 feet away	Approximate threshold of human perception
50	Typical background vibration	None; below typical threshold of perception

Notes VdB = vibration decibel/velocity level
 Source: FTA 2006

3.10.2 Regulatory Setting

Federal Regulations

Federal Transit Administration Guidelines for Construction Vibration

There are no federal regulations for construction-related noise and vibration that apply to the Proposed Project. However, the Federal Transit Administration (FTA) guidelines suggest that for evaluating daytime construction noise impacts in outdoor areas, a noise threshold of 90 dBA L_{eq} should be used for residential areas and a threshold of 100 dBA L_{eq} should be used in commercial and industrial areas.

For construction vibration impacts, the FTA guidelines specify two separate thresholds on construction vibration: one to avoid annoyance and a second to prevent structural damage. Because vibration sensitive structures in the close proximity of the Project Area are primarily residences, the analysis uses the annoyance threshold of 80 VdB for infrequent events—those with fewer than 30 vibration events per day—and the damage threshold of 0.3 in/sec PPV for engineered concrete and masonry structures (FTA 2006).

State Regulations

California Department of Transportation Guidelines for Construction Vibration

There are no state regulations for construction-related noise and vibration that apply to the Proposed Project. However, the California Department of Transportation (Caltrans) published guidelines for evaluating Construction-Induced Vibration (Caltrans 2004). Based on the Caltrans guidelines, the damage threshold for older residential structures is 0.3 in/sec PPV and the annoyance threshold for distinctly perceptible human response is 0.4 in/sec PPV (or 80 VdB). Both thresholds are consistent with the FTA vibration thresholds discussed above.

Local Regulations

City of Sunnyvale Municipal Code

The City of Sunnyvale Municipal Code Section 16.08.030, “Hours of Construction – Time and Noise Limitations,” provides the following regulations related to construction noise:

- Construction activity shall be permitted between the hours of 7 a.m. and 6 p.m. daily Monday through Friday. Saturday hours of operation shall be between 8 a.m. and 5 p.m. There shall be no construction activity on Sunday or national holidays when City offices are closed.
- No loud environmentally disruptive noises, such as air compressors without mufflers, continuously running motors or generators, loud playing musical

instruments, radios, etc., will be allowed where such noises may be a nuisance to adjacent residential neighborhoods.

The City of Sunnyvale's (City's) noise code does not establish a numeric noise threshold for temporary construction activities within the City.

3.10.3 Environmental Setting

Noise-Sensitive Land Uses

Noise-sensitive land uses are generally defined as locations where people reside or where the presence of unwanted sound could adversely affect the use of the land. Noise-sensitive land uses typically include residences, hospitals, schools, guest lodgings, libraries, and certain types of passive recreational uses, such as parks to be used for reading, conversation, meditation, and so forth. (FTA 2006).

Noise sensitive land uses that would be potentially affected by the elevated noise and vibration levels generated by Project construction activities were identified based on site reconnaissance and aerial photographic images of the Project Area. Adjacent to the West Channel Project Work Area, noise-sensitive land uses include hotels and a college located toward the southern end of the Project Work Area. There are no residences located in the vicinity of the West Channel Project Work Area. Adjacent to the East Channel Project Work Area, noise-sensitive land uses include single-family residences, multi-family residences, mobile home parks, and schools. Parks in the Project Area support both active and passive recreation and are not considered noise-sensitive uses.

Existing Noise Environment

The existing ambient noise environment in the Project Area is characteristic of an urban environment and includes transportation sources (i.e., vehicle traffic, trains, and aircraft overflights) and community sources (i.e., commercial and industrial operations). Regional and local roadways running through the City of Sunnyvale are the major noise contributors in the Project Area, which include U.S. Highway (Hwy) 101, State Route (SR) 82, SR 237, and major arterial roadways. Other transportation sources that contribute to the ambient noise environment in the Project Area include Caltrain trains and Santa Clara Valley Transportation Authority (VTA) light rail facilities.

According to the City's projected 2010 noise contour map, noise levels in the Project Area are generally greatest around major roadways and lower in residential areas between major roadways. Regional access roadways generate higher noise levels than local roadways. Outdoor noise levels along major roadways are typically between 74 and 65 dBA L_{dn} and gradually decrease from 64 to less than 60 L_{dn} within residential neighborhoods (City of Sunnyvale 2011). Typical outdoor background noise levels in

suburban residential neighborhoods are between 50 and 60 dBA L_{dn} , while background noise levels in urban residential areas, such as downtown Sunnyvale, are typically higher, between 60 and 70 dBA L_{dn} (FTA 2006).

3.10.4 Impact Analysis

Criteria for Determining Significance

For the purposes of this analysis, the Proposed Project would result in a significant impact on noise and vibration if it would result in:

- a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
- b) Exposure of persons to or generation of excessive vibration.
- c) A substantial temporary or permanent increase in ambient noise levels in the Project Area above levels existing without the Project.

Significance Thresholds

Significance thresholds applicable to the above significance criteria and identified for the Proposed Project are presented in **Table 3.10-3**. These significance criteria are used to determine the significance of impacts evaluated in the “Environmental Impacts” section below.

Table 3.10-3. Applicable Significance Criteria

Significance Criteria	Thresholds	Source
a)	Construction noise generated at any time other than hours between 7 a.m. and 6 p.m. on weekdays and between 8 a.m. and 5 p.m. on Saturdays.	City of Sunnyvale Municipal Code, Construction Noise Ordinance
	Onsite construction noise in excess of 90 dBA L_{eq} at noise-sensitive land uses	FTA Guidelines (FTA 2006)
b)	Annoyance threshold: Vibration in excess of 80 VdB	FTA and Caltrans Guidelines for Construction Vibration (Caltrans 2004)
	Damage threshold: Vibration in excess of 0.3 in/sec PPV	FTA and Caltrans Guidelines for Construction Vibration
c)	Noise creating substantial annoyance or disruption to adjacent noise-sensitive land uses.	n/a
	Traffic noise increase of 5 dB or more. The 5 dB is generally considered to be the threshold of a clearly noticeable change.	n/a

The building damage threshold is measured in PPV, or the maximum speed at which a particle in the ground is moving. The annoyance threshold is measured in VdB, the vibratory velocity level perceived at any time. Thus, these two thresholds represent different vibration intensities generated by construction equipment.

Methodology

Construction of the Project would require the use of heavy equipment that would temporarily increase noise and/or groundborne vibration levels at properties near the Project Work Area. Project impacts are evaluated by comparing estimates of construction generated noise with the significance thresholds identified above. After the Project is constructed, Project maintenance would occur as needed and would require periodic use of smaller equipment. Note that this EIR does not evaluate post-construction Project maintenance activities, which are discussed and analyzed under the District's Stream Maintenance Program Subsequent EIR (refer to Chapter 2, "Project Description"). The Stream Maintenance Program Subsequent EIR is available for review online: <http://valleywater.org/SMPSEIR2011.aspx>. See Volume 2, Chapter 3, Section 3.9 for the Noise impact discussion.

Noise associated with on-site construction activities is identified using estimates of construction equipment noise levels from the Federal Highway Administration's (FHWA's) roadway construction noise model (RCNM). **Table 3.10-4** presents typical noise levels for the types of construction equipment that would be used for the Project. The noise levels listed represent the A-weighted L_{max} , measured at a distance of 50 feet from the construction equipment and the utilization factors for the equipment, defined as the fraction of time that the equipment typically runs at maximum capacity (FHWA 2006). The utilization factor is used to estimate L_{eq} values from L_{max} values.

Table 3.10-5 summarizes typical vibration levels for various types of construction equipment that would be used for the Project (FTA 2006). Floodwalls would be constructed using either concrete or sheet piles, depending on specific locations. With regard to the method that involves sheet piles, the excavator with vibratory hammer would be used to install the floodwalls.

Haul trucks would be routed on main arterial roadways, but access to the Project Work Area would require haul trucks to access local residential streets. Noise impacts associated with increase haul trucks during construction were evaluated using a spreadsheet based on the FHWA traffic noise model. This spreadsheet calculates the traffic noise levels at a fixed distance from the centerline of a roadway, based on the estimated traffic volume, speed, and truck percentage. Traffic noise was evaluated in terms of how Project-related traffic noise increases could affect existing noise-sensitive land uses on existing roadways.

Noise generated by point sources (i.e., stationary use of construction equipment) was estimated to include point-source attenuation of 6 dB per doubling of distance. Noise generated by line sources (i.e., vehicles traveling on streets) was estimated to include line-source attenuation of 3 dB per doubling of distance from the noise source.

Like noise, vibration also attenuates with increasing distance, as a complex function of energy transfer into the ground and the soil conditions through which the vibration is transmitted. Calculations of vibration attenuation followed standard FTA methods (FTA 2006).

Table 3.10-4. Typical Maximum Noise Emission Levels by Construction Equipment

Equipment	Acoustical Utilization Factor (%)	Typical Noise Level at 50 Feet from Source (dBA)	
		L _{max}	L _{eq}
Air compressor	40	78	74
Concrete mixer truck	40	79	75
Dozer	40	82	78
Drum mixer	50	80	77
Dump truck/water truck	40	76	72
Excavator	40	81	77
Flatbed truck	40	74	70
Front-end loader	40	79	75
Grader	40	85	81
Mounted hammer ^a	20	90	83
Paver	50	77	74
Pickup truck	40	75	71
Vibratory roller	20	80	73
Tractor	40	84	80

Notes: dBA = A-weighted decibels; L_{max} = maximum sound levels ; L_{eq} = equivalent sound levels

^a Floodwalls would be constructed using either concrete or sheet piles, depending on specific locations. For method using sheet piles, the excavator with vibratory hammer would be used to install the floodwalls.

Source: FHWA 2006.

Table 3.10-5. Typical Vibration Source Levels by Construction Equipment

Equipment Type	Typical Vibration Level					
	25 Feet from Source		50 Feet from Source		75 Feet from Source	
	PPV (in/sec)	VdB	PPV (in/sec)	VdB	PPV (in/sec)	VdB
Vibratory roller	0.210	94	0.074	85	0.040	80
Vibratory hammer ^a	0.170	93	0.060	84	0.033	79
Large bulldozer	0.089	87	0.031	78	0.017	73
Loaded trucks	0.076	86	0.027	77	0.015	72

Notes: VdB = vibratory decibel/velocity level; PPV = peak particle velocity

^a Floodwalls would be constructed using either concrete or sheet piles, depending on specific locations. For method using sheet piles, the excavator with vibratory hammer would be used to install the floodwalls. The vibration level of a vibratory hammer and a pile driver have similar vibration levels.

Source: Federal Transit Administration 2006.

Environmental Impacts

The impact discussions below are structured as follows. First, the environmental impacts of the Proposed Project in the absence of best management practices (BMPs) are discussed. The discussion then presents applicable District BMPs that would avoid or minimize the level of impact. A conclusion regarding the significance of the environmental impact is then made (considering implementation of the District BMPs, as applicable). If the impact would be significant even with use of BMPs, mitigation measures (MMs) are prescribed. The residual significance of each impact following application of the MMs is then provided.

Impact NO-1: Temporary Generation of Construction Noise in the Project Area in Excess of Applicable Standards – Less than Significant

As described in Section 2.5.4, “Project Construction,” construction of the Project is planned to take place between May 1st and November 1st of 2014 and 2015. Construction would only take place on weekdays between 8 a.m. and 5 p.m. Nighttime work may occur on a short-term basis, if necessary.

Project construction would require the use of heavy equipment that would temporarily increase noise levels at properties near the work sites. On-site construction equipment used for each Project component is summarized in Table 2-5 (in Chapter 2, “Project Description”). Table 3.10-4 presents typical noise levels for the construction equipment. To evaluate the construction noise impacts at adjacent noise-sensitive land uses,

construction equipment of the Project component that would result in the highest noise level is used to estimate the noise levels at various distances from the construction sites, as shown in **Table 3.10-6**. Calculations assumed simultaneous and continuous operation of the three loudest pieces of equipment (a front-end loader, a grader, and a tractor)¹ proposed to be used for each Project component. The estimated construction noise levels reflect a conservative condition where the loudest pieces of equipment are assumed to operate continuously for a 1-hour period. In reality, construction activities would likely be intermittent, so actual noise levels could be somewhat lower than the estimated noise levels. The construction noise calculations are included in **Appendix J**.

Table 3.10-6. Estimated On-site Project Construction Noise Levels

Distance from Construction Site (feet)	Noise Level L_{eq} (dBA)
25	90
50	84
100	76
200	68
300	64
400	60
600	56

Notes: L_{eq} = equivalent sound levels; dBA = A-weighted decibel;
 Onsite noise levels are estimated based on noise generated from three loudest pieces of equipment proposed to be used for each construction activity. Noise levels apply to construction on both the Sunnyvale East and West Channels.

Source: ICF International 2013.

Sunnyvale West Channel

Noise-sensitive land uses adjacent to the West Channel include a college and a hotel with outdoor areas approximately 400–500 feet to the Project Work Area. As shown in Table 3.10-6, the exterior noise level would be less than 60 dBA L_{eq} when Project construction occurs adjacent to these properties. This noise level estimate is below the FTA noise threshold of 90 dBA. There are no residential homes adjacent to the project area along the West Channel.

Sunnyvale East Channel

Noise-sensitive land uses adjacent to the East Channel include single-family residences, multi-family residences, mobile home parks, and schools, all of which are located south of SR 237. The distances between the channel and homes with backyards facing the

¹The District provided a set of equipment that would be used for each construction activity. Although a mounted vibratory hammer would generate the highest noise level, the combined noise level with the other two loudest pieces equipment (a front-end loader and a roller) for the sheet piling activity would result in a slightly lower noise level than the combined noise level of a front-end loader, a grader, and a tractor.

channel are approximately 25–100 feet; the distances between the channel and adjacent schools are approximately 300–600 feet. As shown in Table 3.10-6, the exterior noise level would be 76–90 dBA L_{eq} when Project construction occurs adjacent to these homes, and the exterior noise level would be 64–56 dBA L_{eq} at the schools. Both noise level estimates are below the FTA noise threshold of 90 dBA.

Applicable Best Management Practices

The District would implement best management practices (BMPs) NO-1 and NO-2 to comply with the City's noise ordinance and to minimize noise generation during construction. The full text of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP NO-1: Minimize Noise Pollution

BMP NO-2: Minimize Disturbances to Residential Neighborhoods Due to Noise

Conclusion

The temporary generation of construction noise within the Project Work Area of both Sunnyvale Channels would expose nearby receptors to insubstantial levels of noise. Noise levels generated by the Project are anticipated to be less than applicable noise level thresholds of the FTA's guidelines. Additionally, the District would follow the requirements and procedures specified in the BMPs NO-1 and NO-2 to ensure compliance with the requirements of the City's noise ordinance. The BMP NO-1 would ensure that noise produced by construction activities would be limited to the allowable daytime construction hours specified in the Sunnyvale noise ordinance; the BMP NO-2 would ensure that work are conducted during normal working hours, construction equipment is equipped with adequate mufflers or with manufacture's standard noise control devices, and haul truck traffic is limited to the hours of construction, For these reasons, this impact is considered less than significant.

Impact NO-2: Temporary Groundborne Vibration Resulting in Building Damage or Annoyance in the Project Area – Significant and Unavoidable

This impact evaluates the potential for groundborne vibration generated during Project construction to cause building damage or annoyance within the Project Area (of both channels). The Project Work Area includes the District's existing channel easements/right-of-way and properties both permanently and temporarily acquired for the Proposed Project. As described previously, single-family residential homes are located along the East Channel, and commercial properties are located along the West Channel.

The operation of heavy equipment could potentially generate localized groundborne vibration at buildings adjacent to the Project Area. Construction equipment would be stored at staging areas outside the Project Area and would only potentially be operated

at staging areas for minor improvements to the staging site. Such equipment as large trucks and excavators may be transported between the staging areas and the Project Area.

As show in Table 2-5, Project construction would require the use of vibratory rollers and/or vibratory hammers that could potentially generate excessive groundborne vibration at buildings adjacent to the Project Area. The level of vibration generated by construction equipment and the potential effect on nearby buildings are shown in Table 3.10-5. Table 3.10-5 lists vibration levels (PPV and VdB) for construction equipment as measured from 25, 50, and 75 feet away from the vibration source. Comparison of these measured values against the significance thresholds presented in Table 3.10-3 is discussed below for potential effects of construction activities along the West and East Channels.

Sunnyvale West Channel

Buildings adjacent to the West Channel Project Area are located more than 75 feet away from the Project Area, and there are no vibration-sensitive building (residences, schools, and hotels) within 75 feet of the Project Area. Therefore, vibration from construction activities is not anticipated to exceed the thresholds for building damage or annoyance along the West Channel.

Sunnyvale East Channel

There are no vibration-sensitive buildings (e.g., residences, schools, hotels, and hospitals) downstream/north of Tasman Drive on the East Channel. There are multi-family residential homes located along both banks of the East Channel, between SR 237 and Inverness Way, which are within 25 feet from the Project Work Area. Residences more than 75 feet from the Project Work Area, primarily located adjacent to the east bank of the East Channel, between Tasman Drive and Duane Avenue, are not expected to be affected by groundborne vibration during Project construction activities.

Vibrations from construction activities are not anticipated to exceed the building damage threshold of 0.3 in/sec PPV (see Table 3.10-3) for the residential homes within 25 feet of the East Channel. However, buildings as close as 25 feet and as far away as 75 feet from the East Channel may be affected by vibrations from construction activities resulting in annoyance (vibrations greater than 80 VdB) for persons inside during construction work.

Applicable Best Management Practices

The District would implement BMPs NO-1 and NO-2 to comply with the City's noise ordinance and to minimize noise generation during construction. Full text of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP NO-1: Minimize Noise Pollution

BMP NO-2: Minimize Disturbances to Residential Neighborhoods Due to Noise

Conclusion

Groundborne vibrations associated with the Project are not expected to cause damage to structures along either of the Sunnyvale Channels, or annoyance to persons along the West Channel.

Although the District would implement the BMPs NO-1 and NO-2 to minimize noise generation during construction, these BMPs would not effectively reduce the vibrations from construction activities. Therefore, the construction vibration impact on human annoyance would be potentially significant at residences located within 75 feet the East Channel construction sites between SR 237 and Inverness Way.

The District would implement the following mitigation measure (MM) to further reduce groundborne vibration from Project construction activities.

Mitigation Measure NO-1: Implement Measures to Minimize Construction Vibration.

The District will implement the following measures to minimize vibration impacts at nearby residences surrounding construction activities at the Project Area.

- Phase construction activities that involve the use of vibratory equipment (vibratory roller and vibratory hammer) so the equipment will not operate in the same time period.
- Avoid the use of vibratory equipment where feasible in residential areas within 75 feet of the Project Work Area.

Implementation of MM NO-1 would minimize potential groundborne vibration impacts to the extent feasible. In addition, the groundborne vibration would be intermittent and temporary during the use of the vibratory equipment (vibratory roller and vibratory hammer) and would not be expected cause the building damage; therefore, the permanent vibration impact with the MM is likely to be less than significant. However, because groundborne vibrations still have the potential to cause annoyance to persons in residences within 75 feet of the East Channel during the use of the vibratory equipment, to be conservative, this temporary vibration impact is considered significant and unavoidable.

Impact NO-3: Temporary Increase in Ambient Noise Levels of the Project Area – Less than Significant

On-site Construction Noise

Sunnyvale West Channel

As discussed above in Impact NO-1, the exterior noise level generated by construction in the West Channel Project Work Area would be less than 60 dBA L_{eq} at areas with noise-sensitive land uses (a hotel and a college) adjacent to the West Channel. The anticipated construction noise levels would be generally below the ambient noise levels (60–70 dBA) in the areas surrounded by major arterials. Therefore, the construction of West Channel would not result in substantial increase in ambient noise during construction.

Sunnyvale East Channel

There are residences (mostly single-family homes) along both sides of the East Channel, approximately 25–100 feet from the channel. As discussed above in Impact NO-1, the exterior noise level generated by construction activities along the East Channel would be 76–90 dBA L_{eq} at residences with backyards facing the East Channel. Residences with backyards facing the East Channel are primarily located between Tasman Drive and Inverness Way. Construction noise levels could be substantially higher than the ambient noise levels in a residential neighborhood, and would result in short-term noise disturbance where equipment operates in close proximity to residences.

On-Road Traffic Noise

There are no City ordinances or regulations for traffic noise generated by construction activities. To evaluate the traffic noise impact, a substantial increase of 5 dBA, which is generally considered to be the threshold of a perceptible change, was used for this assessment.

As described in Section 3.13, “Traffic and Transportation,” there would be a maximum increase of approximately 102 trips per day and up to 46 trips in the peak hours on arterial streets and local residential streets that provide access to the Project Area. Truck traffic to and from the Project Work Area (including staging areas) would create additional intermittent noise at nearby residences along haul routes. However, the noise impact would be limited to several seconds of elevated noise during each truck pass. Based on the FHWA traffic noise model, the construction-generated traffic would temporarily increase the ambient noise at homes adjacent to haul routes by less than 2 dBA L_{dn} daily and less than 3 dBA L_{eq} during the peak hour. Thus, the noise increase related to construction traffic is expected to be less than the “substantial increase” criterion of 5 dB. Noise impacts related to construction traffic are considered less than significant, and no mitigation is required. The calculation of construction traffic noise levels is included in **Appendix J**.

Applicable Best Management Practices

The District would implement BMPs NO-1 and NO-2 to comply with the City's noise ordinance and to minimize noise generation during construction. Full text of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP NO-1: Minimize Noise Pollution

BMP NO-2: Minimize Disturbances to Residential Neighborhoods Due to Noise

Conclusion

Project construction noise would not substantially increase existing ambient noise levels in the West Channel Project Area, in the East Channel Project Work Area where no residential backyards are facing the Project Area, and along roadways used by construction vehicles. Project construction noise would temporarily result in a substantial increase in existing ambient noise levels at residences with backyards facing the East Channel. However, implementation of BMPs NO-1 and NO-2 would minimize temporary substantial increases in ambient noise levels along the East Channel from Project construction. For these reasons, this is considered a less-than-significant impact.

Impact NO-4: Permanent Alteration of Ambient Noise Levels from Project Floodwall and Headwall Components – Less than Significant

The Proposed Project would develop floodwalls along the inboard, outboard, or both inboard and outboard locations along numerous reaches of the Sunnyvale Channels. Specific floodwall locations are shown in Figures 2-3a through 2-3i, in Chapter 2, "Project Description". The vertical height of the floodwalls ranges between 1 and 7.5 feet above the existing top of the bank. Headwalls at road crossings would extend vertically from bridges to the top height of floodwalls. The tallest floodwalls/headwalls would be installed downstream/north of Caribbean Drive on both channels. The floodwalls/headwalls would be shorter than the surrounding topography and adjacent facilities associated with the City's Water Pollution Control Plant. The floodwall/headwall heights would generally decrease upstream/south along the channels in residential and commercial areas. The floodwall/headwall heights in the residential and commercial areas would range between 3.5 and 4.5 feet above the top of the channel bank. Headwalls would also be developed at several channel roadway crossings, on bridges crossing over the channels parallel to the roadway. The height of floodwalls/headwalls developed by the Proposed Project would be much shorter than surrounding existing residential and commercial properties.

The floodwalls would be developed parallel to the channels and are not located along busy streets where traffic noise could be reflected back to the noise source. For locations where floodwalls would be installed on both sides of the channel, any sound generated by water flow may result in multiple noise reflections that diffract over the individual floodwalls, but the reflections would be weakened quickly owing to the low

existing sound level and would not be expected to cause a perceptible noise increase over the existing ambient noise levels. Furthermore, in most locations along the Sunnyvale Channels, water flow does not typically result in perceptible ambient noise.

The headwalls at road crossings would be developed in very short spans, typically between approximately 10 and 20 feet, parallel to several local roadways and SR 237. Existing headwalls along SR 237 would be raised one foot for a total finished height of 4 feet above the roadway/bridge surface. Vehicles would be the primary noise sources traveling along roadways. Headwalls extensions from the Project would have the potential to marginally increase the reflection of traffic noise back toward vehicles. However, because of the short height and very short span of floodwalls, most vehicle traffic noise would pass over and around the headwalls. In addition, any noise reflected back would be very briefly perceptible to vehicles because of their fast travelling speeds. Finally, vehicles already generate a high level of ambient noise at these locations, and any increase in reflected noise from headwalls would not be substantially different from existing conditions. For these reasons, headwalls are expected to cause a negligible perceptible noise increase over the existing ambient noise levels on roadways.

Applicable Best Management Practices

There are no District BMPs applicable to this impact.

Conclusion

Floodwalls are not expected to cause a perceptible noise increase over the existing ambient noise levels. Headwalls are expected to cause, at most, a negligible perceptible noise increase over the existing ambient noise levels on roadways. Therefore, permanent impacts to ambient noise levels from floodwalls and headwalls are considered less than significant.

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Chapter 3.11

RECREATION

3.11.1 Introduction

This chapter summarizes the potential impacts on recreational facilities and activities from development and construction of the Proposed Project. The chapter describes existing recreational facilities and activities in the Project Area as a basis to evaluate potential impacts. Where impacts are anticipated, mitigation measures are identified, as feasible, to reduce the level of expected impacts.

3.11.2 Regulatory Setting

Federal Regulations

No specific federal regulations related to recreation are applicable to the Proposed Project.

State Regulations

No specific state regulations related to recreation are applicable to the Proposed Project.

Local Regulations

City of Sunnyvale General Plan

The *Sunnyvale General Plan* (City of Sunnyvale 2011) contains a recreation element in the Community Character chapter that provides information on issues and trends related to quality recreation programming. Additionally, the land use element in the Land Use and Transportation chapter designates the proposed general distribution, location, and extent of the uses of land for housing, business, industry, recreation, education, government, and other categories of public and private uses of land. The following goals are contained in the City of Sunnyvale's (City's) General Plan and are relevant to the Proposed Project.

Community Character—Recreation

Policy CC.11.3: Give priority to acquiring/developing open space and recreational amenities and programs in areas:

- Which are heavily impacted by daytime or business use
- Where similar amenities and programs do not already exist

- Where the current number of households within specified distances relying on the open space or recreational amenity is greater
- Where the projected number of households within specified distances which will be relying on the open space or recreational amenity is greater
- Where the needs are greatest and/or which will meet the greatest needs
- At school sites that, if sold by the District for purposes other than open space, would represent a serious loss to the City's ability to meet its open space and recreation goals.

Policy CC-12.3: Allow opportunities for non-reserved, unstructured use of open space.

Land Use and Transportation—Transportation

Policy LT-5.5d: Maximize the provision of bicycle and pedestrian facilities.

Land Use and Transportation – Open Space

Policy LT-9.4: Support a regional trail system by coordinating with adjacent jurisdictions to facilitate trail connections wherever possible.

City of Sunnyvale Bicycle Plan

The City of Sunnyvale encourages bicycling (City of Sunnyvale 2011). The *City of Sunnyvale 2006 Bicycle Plan* (Bicycle Plan) (City of Sunnyvale 2006) guides the City of Sunnyvale's development of bicycling infrastructure, practices, and policies, all intended to provide a convenient transportation alternative to motor vehicles. The goals of the City's bicycle program include continued build-out of the bikeway network to facilitate commute and recreational trips, development of additional policies and standards to support bicycling in City government and at workplaces, enhancement of education options and their availability for both bicyclists and motorists, and continuation of effective law enforcement.

The Bicycle Plan includes the Tasman/Fair Oaks Area Bicycle/Pedestrian Circulation Plan for the area bounded by the John W. Christian Greenbelt, Morse Avenue, Persian Drive, and the East Channel. This area contains the City's "Futures Areas" 7 and 8, designated as "Industrial To Residential" (ITR). Low-rise light industrial uses within this area are being replaced by Medium-Density Residential (up to 24 Dwelling Units/acre) and High-Density Residential (up to 36 Dwelling Units/acre), served by the Tasman Light Rail line along Tasman Drive to the east and Fair Oaks Avenue across State Route (SR) 237 to the north.

Morse Avenue, Persian Drive, Fair Oaks Avenue, Weddell Drive, and Tasman Drive are on Sunnyvale's bicycle route network, and the John W. Christian Greenbelt and Weddell Drive connect the ITR area to the existing Fair Oaks (Ahwanee to Lakehaven)

overcrossing and the future Borregas overcrossings. Bicycle access to and through the area is ensured through the City's development review and approval process. The following policy and action are applicable to the Proposed Project.

Policy BP.B2: Accommodate bicycling needs in future roadway and land development projects.

Action BP.B2.a: Provide for bicyclists as part of roadway resurfacing and maintenance, road widening, new developments, and property redevelopment.

Moffett Park Specific Plan

The *Moffett Park Specific Plan* (City of Sunnyvale 2004) was adopted by the City in 2004 to guide development of Sunnyvale's major office and industrial area north of SR 237. It includes both Sunnyvale Channels between SR 237 and Caribbean Drive. It creates a zoning category to provide incentives for higher density walkable and bikeable development. The following objective is relevant to the Proposed Project:

Specific Plan Objective CIR-2: Provide for Improved pedestrian and bicyclist mobility within the Specific Plan Area

Santa Clara County Countywide Trails Master Plan Update

The County of Santa Clara Parks and Recreation Department prepared the *Santa Clara County Countywide Trails Master Plan Update* (Santa Clara Parks 1995) as an element of the *Santa Clara County General Plan* in 1995, to guide the development and management of countywide trail routes; public access; and regional parks, including the implementation of a trail network. Two regional trails (Juan Bautista de Anza National Historic Trail and San Francisco Bay Trail) are routed through and adjacent to the Project Area, and one urban connector trail (Hetch-Hetchy Trail) is within the larger Project Vicinity. The following policies in the Trails Master Plan Update are applicable to the Proposed Project:

Policy PR-TS 1.4: The countywide trail system should be linked to provide for regional trails including the Bay Ridge Trail, the Benito-Clara Trail; and the San Francisco Bay Trail systems encircling the urban areas of the County and the San Francisco Bay.

Policy PR-TS 3.7: Development projects proposed on lands that include a trail as shown on the Countywide Trails Master Plan Map may be required to dedicate and/or improve such trail to the extent there is a nexus between the impacts of the proposed development and the dedication/improvement requirement. The dedication/improvement requirement shall be roughly proportional to the impacts of the proposed development.

Policy PR-TS (i) 4.F: Design trail access points to ensure that off-road motorized vehicles do not use trails except for maintenance and emergency purposed or wheelchair access.

3.11.3 Environmental Setting

This section discusses the current recreational resources in the Project Area, including trails and parks. **Figure 3.11-1** shows the location of trails and parks at and near the Project Area. These recreational facilities are described below.

Trails

The majority of maintenance roads along the Sunnyvale Channels are gated; nonetheless, they are commonly used for recreational activities such as bicycling, hiking, and dog walking. Official recreational trails and facilities in or near the Project Area are described below.

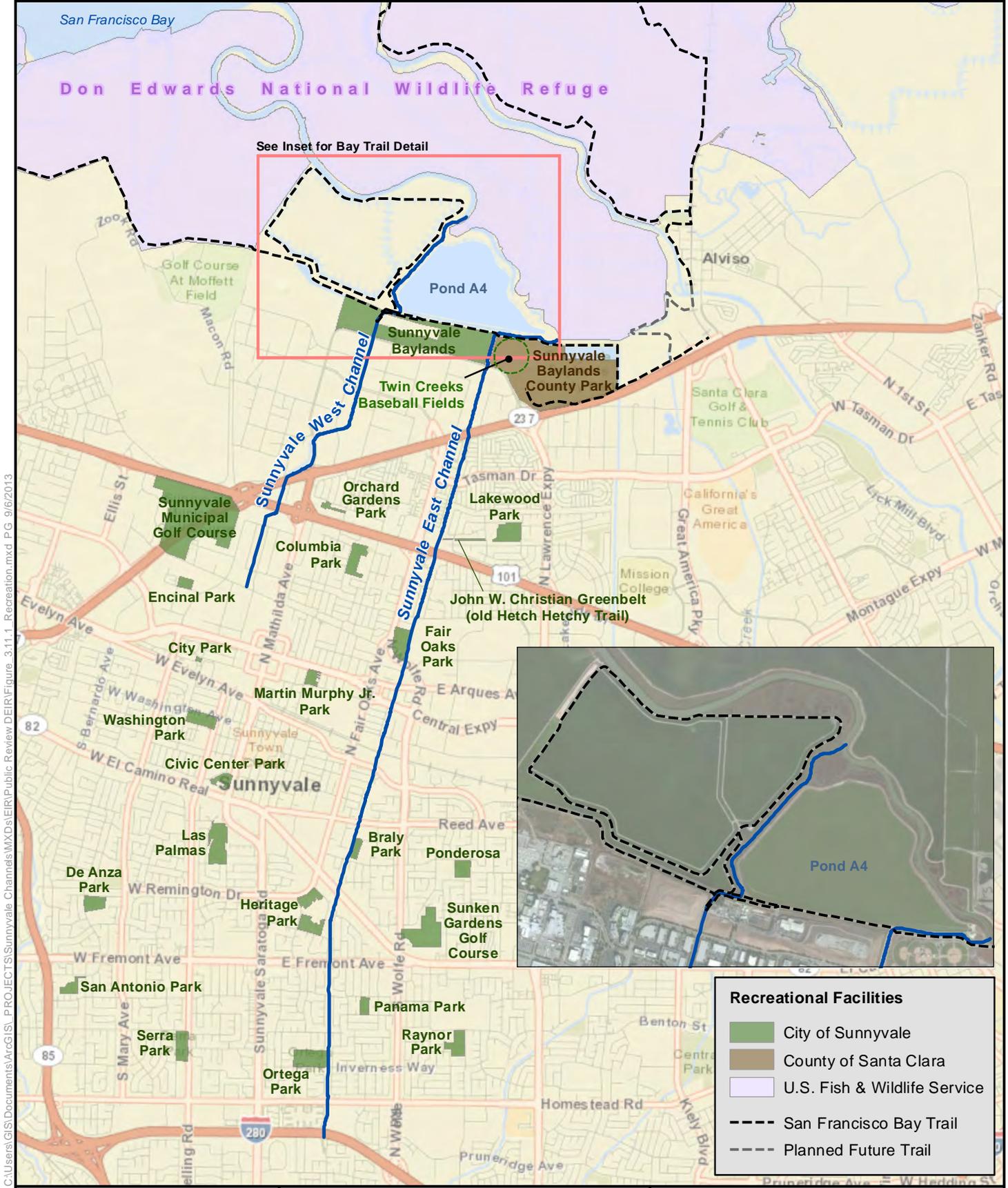
Sunnyvale East Channel between N. Britton Avenue and Wolfe Road

The only authorized/official trail within the proposed Project limits is along the Sunnyvale East Channel between N. Britton Avenue and Wolfe Road. A Joint Use Agreement (JUA) has been executed between the District and the City of Sunnyvale for public use of these approximately 1,200 linear feet. Through much of this reach, the channel is contained within an underground box culvert.

San Francisco Bay Trail

Senate Bill 100, passed into law in 1987, directed the Association of Bay Area Governments (ABAG) to develop a plan for a continuous trail around the Bay (ABAG 2013). The Bay Trail Plan was adopted by ABAG in July 1989. The San Francisco Bay Trail (Bay Trail) is a popular regional trail for hikers, joggers, bicyclists, and others around the San Francisco Bay. It also provides a commute alternative for cyclists, and connects to numerous public transportation facilities. It offers a setting for wildlife viewing and environmental education, and it increases public respect and appreciation for the Bay. Since its inception, the Bay Trail Plan has enjoyed widespread support in the Bay Area. Many local jurisdictions along the Bay Trail alignment have passed resolutions in support of the Bay Trail and have incorporated it into their general plans.

In 1990, the San Francisco Bay Trail Project (Bay Trail Project) was created as a nonprofit organization to plan, promote and advocate implementation of the Bay Trail. The Bay Trail Project does not own land or construct trail segments; instead segments are built, owned, managed and maintained by cities, counties, park districts and other agencies with land-management responsibilities, often in partnership with local nonprofit organizations, citizens' groups or businesses.



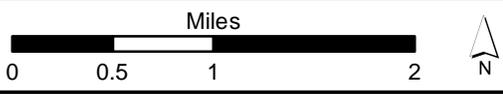
C:\Users\GIS\Documents\ArcGIS\PROJECTS\Sunnyvale_Channels\MXD\Public_Review_DEIR\Figure_3.11.1_Recreation.mxd PG. 9/6/2013



Sources: SCVWD 2012; ESRI

**Figure 3.11-1
Recreational Facilities
in the Project Area**

Prepared for:
Santa Clara Valley Water District
October 2013



*Sunnyvale East and West
Channel Flood Protection Project*

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Approximately 3.5 miles of the Bay Trail traverse along the Bay through the City of Sunnyvale (City of Sunnyvale 2011). As shown in Figure 3.11-1, the Bay Trail is located on the northernmost portions of the maintenance roads of the Sunnyvale channels near the City's Water Pollution Control Plant (WPCP) and Pond A4. There are several access points to the Bay Trail, including a parking area near the WPCP off Borregas Avenue and Caribbean Drive and parking areas near Sunnyvale Baylands Park (City of Sunnyvale 2013a). The Bay Trail is also accessible from the Calabazas Creek Trail, a pedestrian and bicycle trail between Hwy 101 and SR 237, slightly east of the Sunnyvale Baylands Park (City of Sunnyvale 2011).

Closed Sunnyvale Landfill

The closed Sunnyvale landfill, located adjacent to the West Channel near the intersection of Borregas Avenue and Caribbean Drive and across from the WPCP, represents one of the largest areas of open space in Sunnyvale. The landfill is open to the public for a variety of recreational activities such as walking, jogging, bicycling, photographing wildlife and on-leash dog walking. It is especially valued for recreation because portions are adjacent to the Bay Trail (City of Sunnyvale 2011). The walking trails and landfill maintenance roads on the South and West Hills are heavily used for lunch time recreation by employees of companies located in the nearby Moffett Park industrial area. Walking, biking, bird watching and the scenic views from the top of the West Hill are especially popular with the public. In collaboration with Santa Clara Valley Audubon Society, the City offers monthly one-hour bird-watching tours free of charge to the public (City of Sunnyvale 2013b).

Calabazas Creek Trail

The Calabazas Creek Trail is a pedestrian and bicycle trail between U.S. 101 and SR 237 east of the East Channel. The 1.5-mile paved trail connects Mission College, the John W. Christian Greenbelt at Fairwood Park, VTA's Reamwood Light Rail Station, and the San Tomas Aquino and Bay Trails via Old Mountain View-Alviso Road. The trail is a bike-facility construction project for the City of Sunnyvale (ICMA 2006). It provides access to the Bay Trail and Baylands Park via the bicycle/pedestrian bridge over Hwy 101 at Ahwanee Drive.

San Tomas Aquino/Saratoga Creek Trail

The San Tomas Aquino/ Saratoga Creek Trail is located slightly east of the Calabazas Creek Trail in the City of Santa Clara. The trail is open to the public for walking, running, and bicycling from the Bay Trail to Cabrillo Avenue. A City-maintained public parking lot at the Santa Clara Golf & Tennis Club, 5155 Stars & Stripes Drive, provides free parking and trail access (City of Santa Clara 2013a). The San Tomas Aquino Creek Trail is temporarily detoured between Agnew Road and Tasman Drive, within the proposed Project Area, for approximately one year starting April 15, 2013, due to construction unrelated to the proposed Project to re-grade the Great America Theme Park Main

Parking Lot, and construction on abutments and support for the 3 new bridges (City of Santa Clara 2013b).

John W. Christian Greenbelt

The John W. Christian Greenbelt (formally called the Hetch-Hetchy Trail) is an 80-foot-wide, 2.7-mile-long stretch of landscaped greenbelt that links Orchard Gardens Park on the Santa Clara/Sunnyvale border to Lakewood and Fairwood Parks in Sunnyvale. It runs parallel and slightly north of Hwy 101. It was created above the Hetch Hetchy Aqueduct in the mid-1970s as a bare asphalt track for pedestrians and bicycles. It has been improved through landscaping and beautification in 1994 and 2001. The Sunnyvale East Channel crosses underneath the greenbelt; the creek channel is underground in this location.

Juan Bautista de Anza National Historic Trail

The Juan Bautista de Anza Trail commemorates the route taken by Anza in 1775–1776 when he led a group of colonists from Mexico to San Francisco Bay, where they established the Presidio and Mission of San Francisco for New Spain (Santa Clara Parks 1995). The Bay Route of the Juan Bautista de Anza National Historic Trail aligns with the Bay Trail adjacent to the Project Area and is used for hiking, biking, and bird watching. Additionally, Hwy 101 in the Project vicinity has been designated as part of the Juan Bautista de Anza Historic Trail auto tour route to commemorate another of Anza's expeditions through Santa Clara County.

Don Edwards National Wildlife Refuge

The Don Edwards San Francisco Bay National Wildlife Refuge (NWR), encompasses the south San Francisco Bay and offers numerous recreation opportunities from wildlife viewing and weekend interpretive programs to waterfowl hunting and fishing (USFWS 2013). The Don Edwards San Francisco Bay NWR is part of the open space north of the Project Area, surrounding Pond A4 and the adjacent WPCP pond.(Figure 3.11-1). The nearest public access point to the refuge is located at the Refuge Environmental Education Center, in the community of Alviso in San Jose, CA. The Bay Trail adjacent to the proposed Project Area connects to trails within the Don Edwards San Francisco Bay NWR.

Parks

County of Santa Clara Parks

Baylands County Park

Baylands County Park is located at 999 Caribbean Drive, southeast of the Sunnyvale East Channel and east of the Twin Creeks sports facility. Baylands Park provides over 70 acres of developed parkland and an additional 105 acres of seasonal wetland habitat for plants and wildlife. This park is a joint venture between Santa Clara County, which owns the property, and the City of Sunnyvale, which manages and maintains the park.

Various recreational facilities are located at this park, including pathways, picnic areas, playgrounds, and fields. The park is open daily from 8 am to a half hour past sunset.

City of Sunnyvale Public Parks

The City of Sunnyvale's Neighborhood Parks and Open Space Management Program maintains parks, open space systems, and boulevard landscaping for the community. Several City of Sunnyvale parks and public recreational facilities are located in proximity to the Sunnyvale Channels. As shown in Figure 3.11-1, several facilities are operated and maintained by the City near the East Channel and a few parks are near the West Channel (City of Sunnyvale 2013a). These parks are described below.

Sunnyvale Baylands

The City's Baylands Park areas are adjacent to the Santa Clara County Baylands Park and are associated with the City's closed landfill, SMaRT station, and WPCP. These areas are generally open, and a small network of trails connects portions of these areas to the Bay Trail and channel maintenance roads. These trails are used for walking, jogging, biking, and bird watching.

Fair Oaks Park

Opened in 1952, Fair Oaks Park provides 15 acres of recreational opportunities located on Fair Oaks Avenue at Maude Avenue. This park has an Old English theme and features a skate park, basketball courts, horseshoe pits, playfields, restrooms, sand volleyball courts, and a water play area. In addition, the park contains a building and picnic sites available for public use and private rentals.

Braly Park

Located off Daffodil Court, Braly Park features a Japanese theme and includes children's play areas, restrooms, horseshoe pits, shuffle board, sand volleyball court, water play areas, and lighted tennis courts. Adjacent to the park is a public school (Braly Elementary), featuring basketball courts and a field for public use outside of school hours/functions. A park building and several picnic sites are also available for public use and private rentals.

Ortega Park

Ortega Park is a Victorian-themed 18-acre park located at 636 Harrow Way. It features a gazebo, public basketball courts, children's play area, cricket pitch, horseshoe pits, play field, restrooms, shuffle board, and tennis courts.

Twin Creeks Sports Complex

Constructed in 1985, the Twin Creeks Sports Complex is a privately operated recreational area situated near the northern terminus of the East Channel, just south of Pond A4. This complex provides facilities for sports leagues, tournaments, and corporate events. The complex features 10 lighted softball fields, two soccer fields, horseshoe pits, batting cages, basketball and volleyball courts, tournament headquarters, a fast food

restaurant, sports bar concessions, banquet facilities, a pro shop, a barbecue area, an arcade, and offices. The entire facility is gated and entry must be made through a designated entry point (Twin Creeks Sports Complex 2012).

Gap Areas

In 1990, the National Recreation and Park Association developed guidelines that recommended 4-6 acres of open space per 1,000 people. The City of Sunnyvale evaluated the number of households within specified distances from City open space sites. The City's General Plan (City of Sunnyvale 2011) identified several areas within the City limits as underserved residential gap areas for open space. The Project Area along Fair Oaks Avenue between Hwy 101 and SR 237 is within a designated gap area. The City currently has plans to create a recreational trail in this area.

3.11.4 Impact Analysis

Criteria for Determining Significance

For the purposes of this analysis, the Proposed Project would be considered to have a significant impact if it would:

- a) Result in the loss or deterioration of available public recreational opportunities.

Methodology

This section describes the impacts on recreation associated with implementation of the Proposed Project. Impacts were evaluated qualitatively, based on the potential for the Project to disrupt existing or planned recreational access and uses. Information for the analysis was gathered from design plans, a field survey, and maps and plans for recreational facilities. In general, construction activities may result in a short-term loss of recreational opportunities by disrupting use of, or access to, recreation areas or facilities during the immediate construction period.

Project maintenance would occur as needed and may require maintenance activities, such as sediment removal and vegetation management, from within the Sunnyvale Channels, which could impact recreation resources. Potential impacts due to stream maintenance activities are addressed by the District's Stream Maintenance Program Subsequent EIR (refer to Chapter 2.0, "Project Description"). The Stream Maintenance Program Final Subsequent EIR is available for review online: <http://valleywater.org/SMPSEIR2011.aspx>. See Volume 2, Chapter 3, Section 3.11 for the Recreation impact discussion.

Environmental Impacts

The impact discussions below are structured as follows. First, the environmental impacts of the Proposed Project in the absence of best management practices (BMPs) are discussed. The discussion then presents applicable District BMPs that would avoid or minimize the level of impact. A conclusion regarding the significance of the environmental impact is then made (considering implementation of the District BMPs, as applicable). If the impact would be significant even with use of BMPs, mitigation measures (MMs) are prescribed. The residual significance of each impact following application of the MMs is then provided.

Impact REC-1: Temporary Disturbance of Recreational Areas during Project Construction Resulting in a Loss or Deterioration of Recreational Opportunities – Less than Significant

Project construction would generally occur in the District's existing channel easements/right-of-way and property acquired either temporarily or permanently for the project. Temporary construction easements (TCEs) on adjacent parcels may be needed for access or staging of vehicles and equipment, or may need to be closed for public safety reasons. In all, eight different staging areas would be temporarily used during Project construction and four permanent easements would be used for temporary construction activities (locations shown in Figure 3.9-1 of Section 3.9, "Land Use and Planning").

The majority of maintenance roads along the Sunnyvale Channels are currently not officially authorized for recreational use and are often gated; nonetheless, they are commonly used for bicycling, hiking, and dog walking. There would not be any construction activities along the stretch of the East Channel maintenance road that is officially authorized by a JUA with the City of Sunnyvale for recreational use between N. Britton Avenue and Wolfe Road. Access to and use of the Bay Trail near the WPCP and Pond A4 would temporarily be affected by construction activities (Figure 3.11-1). Additionally, floodwall and levee raising activities within proposed permanent easements on the northern end of the West Channel (Easements 1 and 2) would temporarily impede access to small portions of the Bay Trail during construction. Lastly, one of the TCEs (15) would be located on the edge of a recreation baseball field; however, use of the field would not be impaired during construction.

Construction of the Proposed Project would take place in phases over the summers of 2014 and 2015, and is expected to last up to 6 months each year (May through October). Project construction would continuously progress in phases along the Sunnyvale Channels, and thus disruption in any one area would be brief. There are several access points to the 3.5 miles of the Bay Trail within the City of Sunnyvale. The phased approach would ensure that some access points and parts of the trail would

remain open while others are temporarily closed. After construction is complete in each location, the area would be restored to its present condition.

Applicable Best Management Practices

The District would implement the following BMP to notify the public about access and safety measures during construction in recreational areas. Full text of each BMP is provided in Table 2-8 in Chapter 2, "Project Description."

BMP REC-1: Recreational Access and Public Safety Measures

Conclusion

Parks and public-use areas would not be closed during Project construction. Portions of the channel maintenance roads would be temporarily closed during construction and would return to existing conditions after construction is completed. Implementation of BMP REC-1 would provide the public with construction warning signs, safety fencing, and access to detours if feasible during construction. There are several alternative access points to the Bay Trail (Calabazas Creek Trail and San Tomas Aquino Trail) and hiking opportunities (Don Edwards San Francisco Bay NWR and the Sunnyvale Landfill) in the vicinity. For these reasons, this impact is considered less than significant.

Impact REC-2: Permanent Loss or Deterioration of Public Recreational Opportunities Resulting from the Proposed Project – Less than Significant

Impact REC-1 focuses on potential temporary losses of recreation opportunities resulting from the construction of the Project. Impact REC-2 considers any longer term potential effects on recreational opportunities resulting from the Project. The post-Project features of rock slope protection, bridge and culvert modifications, sediment removal, and wingwall and outfall bank stabilization would not alter any areas currently used for unauthorized recreation. The development of Project components along channel maintenance roads adjacent to the Bay Trail in the northern portions of the Project Area would not alter long-term recreational use of these areas. Temporary disruption of maintenance roads and the Bay Trail as a result of construction activities is discussed above, under Impact REC-1. Following construction, access to the maintenance roads and Bay Trail would return to existing conditions.

Floodwalls that would run along the outboard or inboard edge of the existing maintenance roads and Bay Trail would not alter recreational use. The effect of floodwalls on existing views in the downstream areas of the Project Area is discussed in Impact AES-2 in Chapter 3.1, "Aesthetics."

As noted above in Impact REC-1, the Proposed Project would require four permanent easement acquisitions adjacent to the District's existing channel easements. Two of the easements (Easements 1 and 2; refer to Figure 3.9-1 in Chapter 3.9, "Land Use and Planning") would be located on the northern end of the West Channel and would include

portions of the Bay Trail. The District would retain easements at these locations to allow for occasional monitoring and maintenance of the newly constructed floodwalls. After construction is complete, recreational use of the Bay Trail would not be restricted by the easements.

The two permanent land acquisitions would occur on the eastern edge of the East Channel between Tasman Drive and Hwy 101 (Easements 10 and 11). These property acquisitions are located contiguous with the District's existing channel easement and would be acquired to construct an outboard floodwall and to maintain the floodwall and the maintenance road, as necessary. These acquisitions would not be located in a park or authorized recreational area. There would be no impact on recreation from these property acquisitions.

Conclusion

Parks and public-use areas would not be altered by the Proposed Project. Following construction, recreational activities on the Bay Trail would return to existing conditions. The permanent property acquisitions under the Proposed Project would not adversely affect existing authorized recreational opportunities in the project area. Therefore, the potential impact of the Project on long-term recreational opportunities would be less than significant.

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Chapter 3.12

Traffic and Transportation

3.12.1 Introduction

This chapter summarizes the potential traffic and transportation impacts related to the implementation of the Proposed Project. This chapter includes a review of existing roadway and nonmotorized transportation facilities in the Project Area, a summary of applicable local standards and significance criteria related to the impact assessment, and an analysis of traffic and transportation impacts resulting from Project construction. Where feasible, mitigation measures are identified to reduce the level of expected impacts.

3.12.2 Regulatory Setting

Federal Regulations

No specific federal regulations related to traffic and transportation are applicable to the Proposed Project.

State Regulations

California Department of Transportation Guidelines

California Department of Transportation (Caltrans) has jurisdiction over state highway facilities, including freeway segments, signalized intersections on state highways, and on- and off-ramp intersections with local roadways. Improvements to freeways and state highways must meet Caltrans standards. Caltrans recommends a target Level of Service (LOS)¹ between LOS C and LOS D for their facilities. If the location under existing conditions operates worse than the appropriate target LOS, then the existing LOS should be maintained (Caltrans 2002).

¹ LOS is a scale used to determine the operating quality of a roadway segment or intersection based on volume-to-capacity (V/C) ratio or average delay experienced by vehicles on the facility. The levels range from A to F, with LOS A representing free traffic flow and LOS F representing severe traffic congestion.

Local Regulations

Santa Clara County Congestion Management Program

The Project would affect roadways within Santa Clara County. The Santa Clara Valley Transportation Authority (VTA) is the agency responsible for maintaining the performance and standards of the Congestion Management Plan (CMP) roadway system in Santa Clara County, which includes freeways, state highways, and local expressways. Accordingly, the applicable roadway standards and significance criteria set by VTA are used to evaluate the traffic impacts of the Project. VTA published the Transportation Impact Analysis (TIA) Guidelines for evaluating transportation impacts of a new development project on the CMP roadway system. The TIA Guidelines include TIA requirements, traffic operation standards for the CMP system, and significance criteria for determining project-related impacts. Based on the TIA guidelines, VTA strives to maintain LOS E operations on all CMP-monitored facilities. Because traffic generation associated with the Project is not operational and ongoing but short-term and limited to trips generated for construction activities, the impacts of the Project on the operation of CMP roadway facilities are exempt from the LOS standards (VTA 2009). However, for the purposes of the analysis, the CMP standards and significance criteria are used as guidance for evaluating Project impacts on traffic and transportation.

City of Sunnyvale General Plan

The Land Use and Transportation element of the *Sunnyvale General Plan* follows the CMP standards adopted by VTA (VTA 2009). The City's acceptable level of traffic congestion is LOS D for most City-wide roadways and intersections and LOS E for CMP roadways and intersections (City of Sunnyvale 2011).

3.12.3 Environmental Setting

The Sunnyvale Channels are entirely located within the City of Sunnyvale, except for the southern end of the Sunnyvale East Channel, which is located in the City of Cupertino. No Project components are proposed near the southern end of the Sunnyvale East Channel in the City of Cupertino; therefore, this discussion focuses on roadways and transit in the vicinity of the Project Area in Sunnyvale.

Vehicle Access

Owing to the linear nature of the Sunnyvale Channels, numerous roadways cross and/or are located near the Project. Roadways of particular relevance for the Project include roadways that would be used during Project construction and site access, roadways used as transportation routes to and from the Project Area, and roadway crossings of the Sunnyvale Channels that would be directly modified as part of the Project (i.e., bridge/culvert modifications). Figure 2-1 shows the Sunnyvale Channels and the Project

vicinity. Figures 2-3a through 2-3h show the locations of the Project components and roadways providing access to these sites.

Project Vicinity Roadway Network

Roadways in the City of Sunnyvale are designated with functional classifications according to the mobility and access function they are intended to serve. Functional classifications are defined in the list below (City of Sunnyvale 2010).

- **Freeways** are intended to provide for high levels of safety and efficiency in the movement of large volumes of traffic, for long distance/regional trips at high speeds. Freeways have full access control, meaning that they have no at-grade crossings with roads or driveways.
- **Expressways** provide a high degree of mobility within the different cities in the region with relatively high operating speeds. Expressways have some degree of access control to enhance their mobility function.
- **Arterials** are moderate or high-capacity roadways that serve large volumes of traffic between areas in urban centers. Arterials have limited property access directly onto the roads and are designed to carry traffic between neighborhoods.
- **Collectors** serve a dual function in accommodating the shorter trip and feeding the arterials. As such, collectors provide some degree of mobility and also serve abutting properties.
- **Local Streets** have relatively short trip lengths and because property access is their main function, there is little need for mobility or high operating speeds. All roadways not designated as arterials or collectors are designated as local streets.

Table 3.12-1 summarizes regional freeways and expressways and local arterials and collectors that provide access to the Project Area. For each roadway, Table 3.12-1 also provides the designated function classification, the Sunnyvale Channel (East and/or West) served by the roadway, and existing average daily traffic (ADT) volumes on roadway segments in the Project vicinity (City of Sunnyvale 2010).

Regional roadway access (freeways and expressways) to the Project Area is provided by U.S. Highway (Hwy) 101 and State Route (SR) 237 on the north, Interstate (I-) 280 on the south, SR 85 on the west, Lawrence Expressway on the east, and Central Expressway running east-west across the East Channel sites. These freeways and expressway are part of the CMP roadway system in the Project vicinity.

Local arterial and collector roadways provide access to the Project Area between local streets and regional freeways and expressways. As shown in Table 3.12-1, although El Camino Real (SR 82) is a state highway, it is classified as an arterial by the City of

Sunnyvale (City) and the VTA because it functions and is served as an arterial. El Camino Real, Mathilda Avenue, and Sunnyvale-Saratoga Road are part of the CMP roadway system in the Project vicinity.

Table 3.12-1. Major Roadway Connections to the Sunnyvale Channels

Roadway	Sunnyvale Channels Accessed	ADT Volume	ADT Roadway Location/Segment
Freeways			
US 101	West, East	136,000 – 156,000 ^a	SR 85 – Lawrence Expressway
SR 237	West, East	61,000 – 92,000 ^a	SR 85 – Lawrence Expressway
I-280	East	135,000 – 158,000 ^a	SR 85 – Lawrence Expressway
SR 85	East	110,000 – 120,000 ^a	I-280 – SR 237
Expressways			
Lawrence Expressway	West, East	67,000 – 71,000 ^b	SR 82 – US 101
Central Expressway	East	21,000 – 33,700 ^b	SR 85 – Lawrence Expressway
Arterials			
Mathilda Avenue	West, East	19,950 – 46,850 ^c	Maude Avenue – 5th Avenue
Caribbean Drive	West, East	11,490 ^c	Geneva Drive - Crossman Avenue
Java Drive	West, East	6,420 ^c	Borregas Avenue - Geneva Drive
Fair Oaks Avenue	East	21,005 – 30,700 ^c	El Camino Real - Tasman Drive
Wolf Road	East	23,145 - 28,225 ^c	Inverness Way – Kifer Road
Argues Avenue	East	14,220 ^c	Commercial Street – Lawrence Expressway
Evelyn Avenue	East	6,850 ^b	Fair Oaks Avenue - Wolf Road
El Camino Real (SR 82)	East	32,000 – 45,000 ^a	SR 85 – Lawrence Expressway
Sunnyvale-Saratoga Road	East	40,730 – 41,460 ^c	Cheyenne Drive - Remington Drive
Remington Drive	East	20,405 ^c	Sunnyvale-Saratoga Road – Manet Drive
Fremont Avenue	East	16,295 – 19,515 ^c	Pome Avenue - Wolf Road
Homestead Road	East	22,725 ^c	Sunnyvale-Saratoga Road - Wolf Road
Collectors			
Borregas Avenue	West	n/a	
Bordeaux Drive	West	2,130 ^b	5th Avenue – Java Drive
Almanor Avenue	West	n/a	n/a
Moffett Park Drive	West, East	6,395 ^b	Bordeaux Drive - Borregas Avenue
Crossman Avenue	East	n/a	n/a
Persian Drive	East	n/a	n/a

Roadway	Sunnyvale Channels Accessed	ADT Volume	ADT Roadway Location/Segment
Tasman Drive	East	9,940 ^c	Fair Oaks Avenue - Lawrence Expressway
Ahwanee Avenue	East	n/a	n/a
Duane Avenue	East	7,310 ^c	Fair Oaks Avenue – DeGuigne Drive
Kifer Road	East	10,790 ^c	Wolf Road – Commercial Street
Old San Francisco Road	East	3,885 – 4,355 ^b	El Camino Real – Wolf Road
Reed Avenue	East	10,595 ^c	Wolf Road - Evelyn Avenue
Iris Avenue	East	2,760 ^b	Fair Oaks Avenue – Wolf Road
Crescent Avenue	East	1,330	Sunnyvale-Saratoga Road – Manet Drive
Picasso Drive	East	n/a	n/a
Inverness Way	East	n/a	n/a

Notes: ADT = average daily traffic; n/a = no traffic count was collected for the road.

Sources:^a 2011 ADT volumes from Caltrans (Caltrans 2011).

^b 2008-2010 ADT volumes from Existing Conditions Report for Land Use and Transportation Element Update (City of Sunnyvale 2010).

^c 2011-2012 ADT volumes from Sunnyvale traffic count map (City of Sunnyvale 2013).

Project Vicinity Traffic Conditions

VTA annually analyzes and monitors the traffic operating condition of freeways and CMP roadways in the Santa Clara County. According to the 2011 Annual Monitoring and Conformance Report (VTA 2012), the following freeway travel directions in the Project vicinity operate at LOS F during the peak hours. AM peak hours typically extend from 7 a.m. to 9 a.m. and PM peak hours typically extend from 4 p.m. to 6 p.m.

- **Hwy 101:** northbound in both AM and PM peak hours.
- **SR 237:** both directions in both AM and PM peak hours.
- **I-280:** westbound in the AM peak hour and eastbound in the PM peak hour.
- **SR 85:** northbound in the AM peak hour and southbound in the PM peak hour.

Every other year, VTA evaluates expressways and arterials based on the traffic operating condition at the selected intersections on these CMP roadways. According to the VTA's 2010 CMP Annual Monitoring and Conformance Report (VTA 2011a), the intersections along the CMP roadways in the Project vicinity all operate at LOS D or better during the peak hours, except at the Lawrence Expressway/Argues Avenue

intersection, which operates at LOS E. All of these CMP intersections currently operate at an acceptable LOS.

The City evaluates the roadway operating conditions at selected intersections on expressways, arterials, and collectors. According to the Existing Conditions Report for Land Use and Transportation Element Update of the City's General Plan (City of Sunnyvale 2010), all analysis intersections on City and CMP roadways operate at an acceptable LOS (LOS D for City streets and LOS E for CMP roadways).

Public Transit

VTA provides the local and express bus service and light rail service in Santa Clara County, including in the City of Sunnyvale. The bus service is mainly provided on the major road corridors and aims to serve main traffic generators and the connections at light rail stations and Caltrans. The light rail service running through the City and Project Area is known as Route 902 (downtown Mountain View–Winchester Southbound). In the Project vicinity, the light rail route runs along Tasman Drive, Fair Oaks Avenue, Java Drive, and Mathilda Avenue, with five stations located along these routes. **Table 3.12-2** summarizes the bus and light rail routes that run along the major roadways with access to the Project Area.

The Peninsula Corridor Joint Powers Board (JPB) operates the Caltrain train service between San Francisco and Gilroy, including through the City of Sunnyvale. The Caltrain service has two stations located in Sunnyvale. The Sunnyvale Station is located approximately 0.75 mile west of the East Channel, on Evelyn Avenue; the Lawrence Station is located over 1 mile east of the East Channel, off Kifer Road.

Bicycle and Pedestrian Facilities

Bicycle facilities in Sunnyvale are divided into three classes:

- **Bike Paths (Class I)** are paved pathways separated from roadways that are designated for the exclusive use of bicycles and pedestrians.
- **Bike Lanes (Class II)** are lanes on the outside edge of roadways reserved for the exclusive use of bicycles.
- **Bike Routes (Class III)** are roadways signed for bicycle use, but have no separated bike right-of-way (ROW) or lane striping. Bike routes in general are located on low-traffic streets and often are connected to bike lanes and bike paths.

In the Project vicinity, Class I bike paths include the John W. Christian Greenbelt, which crosses the East Channel, north of Hwy 101 and the San Francisco Bay Trail, located at the northern ends of both Sunnyvale Channels (although the San Francisco Bay Trail

path is not a paved surface). Table 3.12-2 summarizes the bicycle facilities on the major Project Area access roadways in the Project vicinity.

Pedestrian walkways comprise sidewalks, off-street trails, and the shared use of shoulders/bike lanes on low-traffic streets. In addition to the John W. Christian Greenbelt San Francisco Bay Trail, walkways provided on the major accessible roadways in the Project vicinity are summarized in Table 3.12-2.

Table 3.12-2. Transit Services, Bikeways, and Walkways on Project Area Accessible Roadways

Roadway	Sunnyvale Channels Accessed	Transit Service	Bikeway ^a	Walkway
Freeways				
US 101	West, East	Route 122	No bikeway	No walk way
SR 237	West, East	Routes 104, 120	No bikeway	No walk way
I-280	East	Routes 101, 103, 182	No bikeway	No walk way
SR 85	East	No transit service	No bikeway	No walk way
Expressways				
Lawrence Expressway	West, East	Routes 55, 121, 122, 328	No bikeway	No walk way
Central Expressway	East	Route 32	No bikeway	No walk way
Arterials				
Mathilda Avenue	West, East	Routes 26, 54, 120, 902 (light rail)	No bikeway	Sidewalks
Caribbean Drive	West, East	Routes 120, 121, 122	Bike lanes	Sidewalks/ Share use of bike lanes
Java Drive	West, East	Routes 26, 54, 120, 121, 122, 321, 328, 902 (light rail)	No bikeway	Sidewalks (partially)
Fair Oaks Avenue	East	Routes 26, 55, 304, 902 (light rail)	Bike lanes (partially)	Sidewalks
Wolf Road	East	Route 26	Bike lanes (partially)	Sidewalks
Argues Avenue	East	Route 304	Bike lanes	Sidewalks
Evelyn Avenue	East	Routes 26, 32, 304	Bike lanes	Sidewalks
El Camino Real (SR 82)	East	Routes 22, 522	No bikeway	Sidewalks
Sunnyvale-Saratoga Road	East	Route 55	Bike lanes	Sidewalks
Remington Drive	East	Route 55	Bike lanes	Sidewalks
Fremont Avenue	East	Route 55	Bike lanes	Sidewalks
Homestead Road	East	No transit service	Bike lanes	Sidewalks

Roadway	Sunnyvale Channels Accessed	Transit Service	Bikeway ^a	Walkway
Collectors				
Borregas Avenue	West	No transit service	Bike lanes	Sidewalks/ Share use of bike lanes
Bordeaux Drive	West	No transit service	Bike lane	Share use of bike lanes
Almanor Avenue	West	No transit service	Bike lanes	Sidewalks/ Share use of bike lanes
Moffett Park Drive	West, East	No transit service	Bike lanes	Sidewalks/ Share use of bike lanes
Crossman Avenue	East	Routes 120, 121, 122, 321, 328	Bike lanes	Sidewalks
Persian Drive	East	No transit service	Bike lanes	Share use of bike lanes
Tasman Drive	East	Route 902 (light rail)	No bikeway	Sidewalks (partially)
Ahwanee Avenue	East	No transit service	No bikeway	Sidewalks
Duane Avenue	East	Route 55	No bikeway	Sidewalks
Kifer Road	East	No transit service	Bike lanes	Sidewalks
Old San Francisco Road	East	Routes 26, 55	Bike lanes	Sidewalks
Reed Avenue	East	Route 32	Bike lanes	Sidewalks
Iris Avenue	East	No transit service	No bikeway	Sidewalks
Crescent Avenue	East	No transit service	No bikeway	Sidewalks
Picasso Drive	East	No transit service	No bikeway	Sidewalks
Inverness Way	East	No transit service	No bikeway	Sidewalks

Notes: ^a Bikeways, as defined by the City, include Class I bike paths, Class II bike lanes, and Class III bike routes.

Source: VTA 2011b, 2013.

3.12.4 Impact Analysis

Criteria for Determining Significance

For the purposes of this analysis, the Project would result in a significant impact on traffic and transportation if it would:

- a) Exceed, either individually or cumulatively, LOS standards established by local or regional agencies for designated roads or highways; or otherwise cause a substantial increase in traffic in relation to the planned or designated traffic load and capacity of the circulation system;
- b) Substantially increase hazards or result in substantial safety risks due to a design feature (e.g., sharp curves, inadequate emergency service access, or dangerous intersections) or incompatible uses (e.g., haul routes through residential neighborhoods or by schools);
- c) Result in inadequate emergency access or interfere with an adopted emergency evacuation plan;
- d) Result in incompatible land uses through inadequate parking capacity or parking and staging activities on residential streets; or
- e) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle lanes, bicycle racks).

Methodology

The Project proposes to construct multiple channel improvements at various locations along the Sunnyvale Channels. Construction activities would intermittently generate temporary increases in existing traffic volumes for materials delivery and construction employee access. Once the Project is constructed, maintenance needs would be very limited and are expected to be less than the current maintenance needs. Note that this EIR does not evaluate post-construction Project maintenance activities that are discussed and analyzed under the District's Stream Maintenance Program Subsequent EIR (refer to Chapter 2.0, "Project Description"). The Stream Maintenance Program Subsequent EIR is available for review online: <http://valleywater.org/SMPSEIR2011.aspx>. See Volume 2, Chapter 3, Section 3.12 for the Traffic and Transportation impact discussion.

Construction Traffic Generation

Short-term traffic increases (expressed as daily and hourly trips) on the local and regional roadways in the Project Area are estimated using 1) assumptions of construction phasing described in Section 2.5.3, "Project Construction," and 2)

construction data provided by the District, including the construction duration, crew size, and truck loads (for earthmoving and materials delivery) for construction of each Project component on each Project roadway crossing or reach (defined by channel roadway crossings). The following assumptions and approaches are used in estimating the construction traffic increase on roadways with access to the Project Area.

- Daily and hourly trips are first calculated for each construction activity for each Project component. Project construction activities are identified for each Project component in Table 2-4. The weighted average of trips (based on construction activities and project components) are then calculated for each project site reach. The weighted average value is the average of trips generated by each construction activity for a project reach relevant to the construction duration of each activity. The analysis uses the weighted average trips to evaluate the traffic impact because the construction activity that generates the maximum trips typically only lasts a few days. The weighted average trips are calculated based on the total trips and durations of every construction activity of a particular Project roadway crossing or reach.
- Hourly trips are then calculated for peak hours, which consist of 1) worker commute trips (assuming all workers coming and leaving the work site in the same hour), and 2) the average hourly truck trips (assuming trucks coming and leaving the work site evenly in a 8-hour work day). This estimate is conservative because truck hauling trips would typically only occur during non-peak hours and would not occur at the same time as worker commute trips.
- The maximum trips anticipated on local Project-accessible roadways are estimated by adding the trips from two adjacent reaches to account for the worst traffic impact on local streets (i.e. activities in the adjacent reaches occur on the same day and are using the same local streets to access the work sites in these reaches). Similar to above, this is a conservative approach to provide an indication of maximum trip conditions.
- The total Project-wide trips anticipated on regional and local Project-accessible roadways are calculated by summing the maximum local trips estimated for each Sunnyvale Channel (as described in the bullet item above).

Table 3.12-3 summarizes the average daily and maximum hourly construction generated trips for each Project channel roadway crossing and reach (referred to as “locations”) and the sum of trips for adjacent locations. **Table 3.12-4** summarizes the maximum construction-generated trips that would occur on local and regional Project-accessible roadways. Detailed calculations of construction trip generation and the distribution of construction trips on regional and local roadways is included in this EIR as **Appendix K-1**.

Table 3.12-3. Project Reach Construction Trip Generation

Location: Project Roadway Crossing or Reach	Trips Per Project Location		Sum of Trips from Adjacent Locations	
	Average (trips/day)	Maximum (trips/hour)	Average (trips/day)	Maximum (trips/hour)
Sunnyvale East Channel				
Downstream confluence with Guadalupe Slough to Caribbean Drive	40	23	-	-
Caribbean Drive Bridge Reconstruction	33	24	73	47
Caribbean Drive to Moffett Park Drive	36	22	69	46
Moffett Park Drive	10	8	46	30
Moffett Park Drive to Hwy 237	50	24	60	32
Hwy 237	10	8	60	32
Hwy 237 to Persian Drive	50	24	60	32
Persian Drive	10	8	60	32
Persian Drive to Tasman Drive	30	21	40	29
Tasman Drive to Hwy 101/Ahwanee Avenue	29	21	59	42
Ahwanee Avenue to Blythe Avenue	28	21	57	42
Blythe Avenue to East Duane Avenue	27	21	55	42
East Duane Avenue to North Wolfe Road	55	25	82	46
North Wolfe Road to East Arques Avenue	30	20	85	45
East Arques Avenue	10	8	40	28
East Arques Avenue to Central Expressway	22	18	32	26
Central Expressway to Kifer Road	36	22	58	40
Kifer Road to UPRR/Caltrain	34	22	70	44
UPRR/Caltrain to East Evelyn Avenue	17	13	51	35
East Evelyn Avenue	10	8	27	21
East Evelyn Avenue to Old San Francisco Road	21	16	31	24
Old San Francisco Road to Iris Avenue	19	18	40	34
Iris Avenue to El Camino Real	60	25	79	43
El Camino Real to Crescent Avenue	25	21	85	46
Crescent Avenue to East Fremont Avenue	22	20	47	41
East Fremont Avenue to Ashbourne Drive	30	21	52	41
Ashbourne Drive to Carlisle Way	36	23	66	44
Carlisle Way to Dunholme Way	25	21	61	44
Dunholme Way to Inverness Way	27	21	52	42

Location: Project Roadway Crossing or Reach	Trips Per Project Location		Sum of Trips from Adjacent Locations	
	Average (trips/day)	Maximum (trips/hour)	Average (trips/day)	Maximum (trips/hour)
Sunnyvale West Channel				
Downstream confluence with Guadalupe Slough to Carl Road	28	22	-	-
Carl Road to Caribbean Drive	74	24	102	46
Carl Road Bridge Reconstruction	16	13	90	37
Caribbean Drive	10	8	26	21
Caribbean Drive to West Java Drive	38	27	48	35
West Java Drive	14	12	52	39
West Java Drive to Bordeaux Drive	32	24	46	36
Bordeaux Drive	10	8	42	32
Bordeaux Drive to Mathilda Avenue	31	24	41	32
Ross Drive to Hwy 101	24	21	55	45
Hwy 101 to Almanor	30	21	54	42

Notes: All values are weighted averages of the construction activities proposed for each Project roadway crossing/reach. Construction on the listed Project reaches would occur over construction seasons in two years.

Source: ICF International 2013 (see Appendix K).

Table 3.12-4. Maximum Potential Construction Trip Generation on Project Access Roadways

Roadway	West Channel		East Channel		Project-wide	
	trips/day	trips/hour	trips/day	trips/hour	trips/day	trips/hour
Channel Construction	102	46	85	46	187	92
Caribbean Bridge Construction (East Channel)	-	-	33	24	33	24
Maximum potential trip increase on most arterials and local streets	102	46	85	46	-	-
Maximum potential trip increase on regional highways	-	-	-	-	220	116

Source: ICF International. 2013. (see Appendix K).

Caribbean Drive Bridge Replacement Level of Service Analysis

The Caribbean Drive bridge crossing the East Channel would be replaced with a new box culvert as part of the Project. Half of the box culvert (either westbound or eastbound lanes) will be constructed during the summer of the first year and the other half will be built during the summer of second year. Reconstruction of the Caribbean Drive bridge would occur over approximately 11.5 consecutive weeks during the two summer construction seasons.

Because the construction would involve with lane closures of one direction at a time, traffic capacity of Caribbean Drive near the bridge would be reduced substantially by 50%. To evaluate the potential impact on traffic operation along Caribbean Drive during construction, intersection LOS analysis was conducted for both AM and PM peak hours at three signalized intersections (Caribbean Drive/Moffett Park Drive, Caribbean Drive/Twin Creeks driveway, and Caribbean Drive/Crossman Avenue), by using the weekday traffic volumes collected on February 6, 2013. Intersection LOS is calculated using the LOS method described in the *Highway Capacity Manual* (Transportation Research Board 2000), which is adopted by the VTA and the City for intersection analysis. **Table 3.12-5** summarizes the peak-hour LOS and delay at these intersections under the existing condition and the construction condition. The LOS modeling outputs are included in **Appendix K-2**.

Table 3.12-5. Intersection LOS near Caribbean Drive Bridge

Intersection	Peak Hour ¹	2013 Existing		2013 Existing + Box Culvert Reconstruction	
		LOS	Average Delay (seconds/vehicle)	LOS	Average Delay (seconds/vehicle)
Caribbean Drive/Moffett Park Drive	AM	B	12	B	12
	PM	C	26	C	26
Caribbean Drive/Twin Creeks driveway	AM	B	17	D	39
	PM	B	19	D	40
Caribbean Drive/Crossman Avenue	AM	B	14	B	20
	PM	B	16	C	21

Notes: LOS = level of service

¹AM peak hour = 7 am – 9 am; PM peak hour = 4 pm – 6 pm

Source: ICF International 2013 (see Appendix K).

Environmental Impacts

Note that impact discussions are structured to first present the potential environmental changes under the Proposed Project and the level of significance of environmental impacts. The discussion then presents applicable District BMPs that would avoid or minimize the level of impact. With consideration of the District BMPs, the significance of the environmental impact is restated. If the impact would still be significant, mitigation measures (MMs) are prescribed. Lastly, the impact conclusion is stated after consideration of District BMPs and MMs.

Impact TR-1: Temporary Construction Traffic Generation in Exceedance of Roadway LOS Standards or Substantial Increase in Traffic – Less than Significant with Mitigation

Traffic Increase on Project Access Roadways

Project construction would generate trips on several roadways within the Project Area throughout the construction period. Construction trip generation is presented in Tables 3.12-4 and 3.12-5, above. Construction at any Project location would be temporary, as construction would gradually move to different locations along the linear Project Area. As such, trip generation at any particular location and adjacent locations would be temporary and last anywhere from a couple days to a few months, only a portion of the overall Project construction period.

As discussed in the “Environmental Setting” section, above, Hwy 101, SR 237, SR 85, and I-280 in the Project vicinity operate at LOS F during the peak hours. Based on the significance threshold defined by the CMP, a project would result in a significant traffic impact if the project would add more trips than 1% of the peak-hour freeway capacity on freeway segments that operate at LOS F (VTA 2009). As shown in Table 3.12-4, Project construction is anticipated to generate a combined maximum of up to 116 vehicle trips during peak hours. The trips added to the individual freeway segments would be less than 1% peak-hour capacity of these freeways. Therefore, construction-related traffic is not expected to significantly degrade the operation or LOS of the freeways. Calculation of peak-hour freeway capacities and the added construction trips on these freeways are included in **Appendix K-2**.

As discussed in the “Environmental Setting” section above, key intersections along expressways and City streets in the Project vicinity all operate below the LOS standards (LOS E for CMP roadways and LOS D for City streets). As shown in Table 3.12-4, Project construction is anticipated to add up to 46 peak-hour trips on Sunnyvale Channel-accessible roadways and up to 85 or 102 daily trips on East and West Channel-accessible roadways, respectively. The small number of construction trips is unlikely to degrade the intersection operation along expressways and major streets. Therefore, this construction-related traffic is not expected to significantly degrade the operation of expressways or most of arterial roadways.

For local residential streets and minor collector streets in the immediate vicinity of the site, traffic generated by construction activities could result in a substantial traffic increase because of the relatively small traffic volume on these streets. Although construction traffic is unlikely to degrade the level of existing traffic operation to an unacceptable level, the addition of heavy trucks and other construction traffic could temporarily disrupt traffic flow on these minor collectors and residential streets.

Bridge and Culvert Modifications

Bridges and culverts would be modified at several roadway crossings of the Sunnyvale Channels. Modifications are currently proposed at six crossings along the East Channel and four crossings along the West Channel, as shown in Figures 2-3a through 2-3g. Table 2-1 summarizes the proposed modifications at these crossings. **Table 3.12-6** lists the anticipated lane closures and the proposed traffic management measures for these crossings.

Table 3.12-6. Temporary Lane Closures and Traffic Management at Roadway Crossings

Roadway Crossing	Lane Closures and Traffic Management
Sunnyvale East Channel	
Caribbean Drive	Half of the Caribbean Drive bridge (either westbound or eastbound lanes) would be reconstructed during the summer of 2014 and the other half during the summer of 2015. Traffic would be diverted over the median to the opposite side, to continued two-way travel on Caribbean Drive. Four lanes would be maintained during construction - two lanes in each direction. The lanes would be approximately 10 feet, smaller than currently operating lanes on Caribbean Drive. As such, traffic speeds would likely be reduced. Signage would be provided by the District's contractor.
Moffett Park Drive; Persian Drive; East Arques Avenue; & East Evelyn Avenue	Construction would primarily require closure of the roadway shoulder. Lane closure would not be typical but could be required for concrete pouring, at most, for a few hours one day between 9 a.m. and 3 p.m. at each roadway crossing.
Highway 237	Construction would primarily require closure of the roadway shoulder. Lane closure would not be typical but could be required for concrete pouring, at most, for three nights between 9 p.m. and 4 a.m.
Sunnyvale West Channel	
Carl Road	The existing bridge/culvert would be completely reconstructed in the summer of 2014. Construction would occur after the west bank levee on Carl Road to Caribbean Drive has been constructed, which would allow City access to treatment ponds that are typically accessed over Carl Road.
Caribbean Drive; West Java Drive; & Bordeaux Drive	Construction would primarily require closure of the roadway shoulder. Lane closure would not be typical but could be required for work on both the upstream and downstream sides of each bridge/culvert crossing, at most, for a few hours on two days between 9 a.m. and 3 p.m. at each roadway crossing.

The traffic operation impacts at the Caribbean Drive and Carl Road crossings are discussed in the sections below. For other roadway crossings, construction would

primarily require closure of the roadway shoulder. Lane closure would not be typical but could be required for a few hours (during non-peak hours) in a few days (up to 3 days). Because the lane closure would only occur during non-peak hours and the crossings are mostly located on low-volume streets, the short-term closure is unlikely to degrade the level of existing traffic operation to an unacceptable level. However, the lane closure could impair roadway capacity and increase travel time on the street segments adjacent to the crossings for a few hours.

Lane Reduction during Caribbean Drive Bridge Replacement

As described in the “Methodology” section above, the vehicle travel lanes on Caribbean Drive between Crossman Avenue and Moffett Park Drive would be reduced from three lanes to two lanes during the summer of both construction years. As show in Table 3.14-5, the lane reduction is not expected to significantly degrade the intersection operation to exceed the LOS standard (LOS D). However, vehicles traveling along the segment could experience a small increase in travel time during construction.

Vehicle Access during Carl Road Bridge Replacement

The Carl Road bridge crossing over the West Channel is currently used by the City to access treatment ponds associated with the City’s Water Pollution Control Plant (WPCP), located to the north of this area near Pond A4. To maintain access to the western landfill during the bridge replacement, the west bank levee/maintenance road between Carl Road and Caribbean Drive would be constructed prior to the reconstruction of the Carl Road box culvert.

The City of Sunnyvale typically uses the Carl Road to Caribbean reach for approximately three vehicle trips per day to access ancillary facilities associated with the WPCP. During construction of the levee enlargement along this reach, the City would have to find an alternative route for these three trips per day. A likely alternative may be conducted by traveling west/north on Caribbean Drive from the WPCP and then turning west onto 1st Avenue. The detour of these three vehicle trips per day is anticipated to have an unnoticeable and unsubstantial effect on existing traffic levels along the detour route.

Applicable Best Management Practices

The District would implement best management practice (BMP) TR-1 to give adequate warning to the public of the construction and of any dangerous condition to be encountered as a result of the construction. Full text of this BMP is provided in Table 2-8 in Chapter 2, “Project Description.”

BMP TR-1: Use Suitable Public Safety Measures

Conclusion

The generation of construction-related traffic is not expected to significantly degrade the operation of freeways, expressways, or major arterials or collectors. The addition of heavy trucks and other construction traffic could temporarily disrupt traffic flow on minor collectors and residential streets and could result in a substantial traffic increase because of the relatively small traffic volume on these streets. Lane closures associated with construction would temporarily result in a small increase in travel time along Caribbean Drive between Crossman Avenue and Moffett Park Drive, although an insubstantial impact on the LOS of these intersections would result. Lane closures also may impair roadway capacity and increase travel time on the street segments adjacent to the crossings for a few hours. Although the District would implement the BMP TR-1 to increase public awareness and minimize safety impacts during construction, the BMP would not effectively reduce the temporary potential impacts on traffic operation, and potentially significant impacts on existing traffic using local roadways could still result. The District would implement the following mitigation measure (MM) to further control traffic generated during Project construction activities.

Mitigation Measure TR-1: Develop and Implement a Site-Specific Traffic Control Plan

The District will develop a site-specific traffic control plan with the following mitigating actions to minimize the effects of Project construction activities and traffic on surrounding roadways, bicycle and pedestrian facilities, transit services, and emergency access. The plan will be prepared by a licensed traffic engineer and be approved by the City of Sunnyvale.

Traffic control shall consist of all work and materials necessary to maintain safe vehicular, pedestrian, and cyclist traffic during construction and mitigate high peak and high volume construction traffic, prevent idling and queuing, establish site access limitations and mitigation measures, identify haul routes, and provide overall control of all construction traffic entering and exiting and operating within the project area.

To reduce traffic and related impacts during Project construction, the following mitigating actions will be specified in the Project construction traffic control plan:

- Prohibit work-site access via residential streets unless expressly approved by the City.
- Provide advance construction warning signage for lane closures. Limit lane closures to the duration and area required for safety.
- Restrict truck access to truck routes designated by the City. Heavy construction vehicles will be prohibited from accessing the Project Site from other routes.
- Limit truck access to the Project site between 7:00 a.m. and 6:00 p.m., unless approved in advance by the City in writing.

- Limit truck traffic on residential streets. At any given time, only two trucks are permitted on a residential street.
- Provide advance notification of necessary closures on pedestrian/bicycle facilities and maintain bicycle/pedestrian access and circulation during Project construction where safe to do so. Provide safe detour routes for bicycles and pedestrians if any closures on sidewalks, walkways, bike lanes, or trails are required.
- Provide crossing guards and/or flag persons as needed to avoid traffic conflicts and ensure pedestrian and bicyclist safety.
- Notify and consult with emergency service providers, and provide emergency access by whatever means necessary, to expedite and facilitate the passage of emergency vehicles. Ensure clear emergency access to all existing buildings and facilities at all times. The District will submit a Safety and Health Plan, including emergency access plans, for approval by emergency service providers in the affected areas (including local Police and Fire Departments) as part of the traffic control plan.
- Repair or restore the road ROW to its original condition or better upon completion of the work.
- Provide adequate parking for construction vehicles, equipment, and workers within the designated staging areas. If adequate parking space is not available at a given work site and staging area, provide an off-site parking area at another suitable location, and coordinate the daily transport of construction vehicles, equipment, and personnel to and from the work site, as needed. Trucks or worker vehicles are prohibited from parking or queuing on neighborhood streets.
- Maintain the access of the entrance/exit driveways at the City's WPCP or at other City facilities, unless approved alternative access is provided or otherwise noted in the traffic control plan.

The Project construction traffic control plan will be approved by the City of Sunnyvale prior to the mobilization of any construction equipment to the Project Site and commencement of daily construction activities. The District would also coordinate, as necessary, with Caltrans and/or VTA, for traffic controls and measures affecting Caltrans and/or VTA facilities. The District will be responsible for ensuring that the plan is effectively implemented.

Implementation of MM TR-1 would minimize the traffic operation impact on residential streets, at roadway crossing during lane closures, and on Caribbean Drive during bridge replacement. Therefore, overall impacts on traffic levels would be less than significant with mitigation.

Impact TR2: Temporary Substantial Increase in Safety Hazards – Less than Significant with Mitigation

The presence of large, slow-moving construction-related vehicles and equipment among the general-purpose traffic on roadways in the Project Area could result in significant safety hazards, especially on minor collectors and residential streets and at roadway crossings where temporary lane closures would be required.

Applicable Best Management Practices

The District would implement BMP TR-1 to install fences, barriers, lights, flagging, guards, and signs to address the potential for safety hazards related to construction traffic. A description of this BMP is provided in Chapter 2, "Project Description."

BMP TR-1: Use Suitable Public Safety Measures

Conclusion

Even after the implementation of BMP TR-1, Project construction has the potential to result in safety hazards. This is considered a potentially significant impact. However, the District would implement the following MM to reduce impacts related to traffic safety to a less-than-significant level.

Mitigation Measure TR-1: Develop and Implement a Site-Specific Traffic Control Plan

Refer to the complete description of this measure in Impact TR-1, above.

Impact TR-3: Temporary Increases in Emergency Response Times – Less than Significant with Mitigation

Slow-moving construction trucks could potentially delay or obstruct the movement of emergency vehicles on area roadways. In addition, lane closures at roadway crossings (especially at Caribbean Drive as discussed in Table 3.12-6) could potentially impair roadway capacity and substantially increase the response time for emergency vehicles traveling through the lane closure area.

Applicable Best Management Practices

No District BMPs are applicable to this impact.

Conclusion

Since construction could temporarily increase the responding time of emergency vehicles, this impact is considered potentially significant. The District would implement the following MM to manage emergency response times during Project construction activities.

Mitigation Measure TR-1: Develop and Implement a Site-Specific Traffic Control Plan

Refer to the complete description of this measure in Impact TR-1, above.

With the implementation of MM TR-1, potential impacts on emergency response times would be reduced to a less-than-significant level.

Impact TR-4: Temporary Reduction in Parking Capacity – Less than Significant

During Project construction, the District would not use local roadways for any parking or staging of construction equipment or worker vehicles. Staging/storing of construction equipment would be limited to designated Project staging areas and the ROW, including existing ROW and property acquired for the Project (as identified in Table 2-2 and Figures 2-3a through 2-3g). It is anticipated that the District has sufficient capacity for worker vehicle parking, owing to the large extent of ROW the District currently possesses along the Sunnyvale Channels.

Temporary Construction Easements (TCEs) 5 to 9 (refer to Figure 3.9-1 and Table 3.9-1 in Chapter 3.9, “Land Use and Planning”) are necessary for construction at specific locations along the West Channel upstream of Caribbean Drive. Each of these TCEs would be used by the District between 3 and 6 months. TCE 5 is a small portion of a parking lot owned by Bordeaux-Borregas Campus, LLC property. TCEs 6 and 7 are small portions of a business parking lot owned by Mathilda Ave Campus, LLC. TCE 8 is a currently undeveloped parcel located south of Ross Drive and north of Hwy 101. TCE 9, currently used for parking, is located directly south of Hwy 101. TCEs 8 and 9 are parts of property owned by the City and County of San Francisco. During construction of the Project, existing use of parking lots within the area of the TCEs would be negotiated with the property owner such that businesses and the public would be minimally affected by construction activities. TCEs 5 to 9 represent only a small portion of each parking lot (Figure 3.9-1), and the majority of parking spots in these lots would remain available to businesses. After development of the Project, parking lots would continue to provide parking, as currently occurs. Any damage to parking lots would be restored to the original condition upon completion of construction activities.

Applicable Best Management Practices

No District BMPs are applicable to this impact.

Conclusion

The District is expected to have sufficient capacity within the designated staging areas and District ROW for equipment staging and parking of worker vehicles. The District use of parking lot areas for TCEs 5–9 would not significantly affect parking capacity for

existing business operations during the District’s use of these TCEs for construction staging. This impact is less than significant.

Impact TR-5: Temporary Conflicts with Alternative Transportation – Less than Significant with Mitigation

Construction of the Project would require temporary closure of short portions of the existing San Francisco Bay Trail located at the northern ends of both Sunnyvale Channels for possible safety reasons. In addition, at roadway crossings, construction would require temporary closures of bike lanes or sidewalks. **Table 3.12-7** summarizes pedestrian and bicycle facilities that would require temporary closures during construction at channel roadway crossings. While these facilities are temporarily closed, users would have to find other similar facilities in the area to use (e.g., sidewalks and bike paths on other roads) or alternative modes of transportation.

Construction of Caribbean Drive Bridge and modifications at roadway crossings would require short-term lane closures, which could potentially impair roadway capacity and increase travel time for vehicles, including buses, traveling through the lane-closure area.

The Project would also permanently improve alternative transportation facilities by constructing new sidewalks at Caribbean Drive bridge on the East Channel and replacing existing sidewalks at the West Java Drive crossing over the West Channel.

Table 3.12-7. Closures of Walkways and Bikeways at Roadway Crossings

Figure# (ID)	Roadway Crossing	Closures of Walkways and Bikeways
Sunnyvale East Channel		
2-3d (E1)	Caribbean Drive	Both bike lanes
2-3e (E2)	Moffett Park Drive	Westbound bike lane
2-3e (E3)	SR 237	No walkway and bikeway on SR 237
2-3e (E4)	Persian Drive	Eastbound shoulder
2-3e (E5)	Arques Avenue	Westbound sidewalk and bike lane
2-3f (E6)	Evelyn Avenue	Eastbound sidewalk and bike lane
Sunnyvale West Channel		
2-3a (W1)	Carl Road	No walkway and bikeway on Carl Road
2-3a (W2)	Caribbean Drive	Both bike lanes.
2-3a (W3)	Java Drive	Both sidewalks
2-3b (W4)	Bordeaux Drive	Both bike lanes

Applicable Best Management Practices

No District BMPs are applicable to this impact.

Conclusion

Since Project construction would temporarily close sidewalks and bike lanes used for alternative modes of transportation and could temporarily reduce the travel time of buses, this impact is considered potentially significant. The District would implement the following MM to manage traffic on local roadways during Project construction activities.

Mitigation Measure TR-1: Develop and Implement a Site-Specific Traffic Control Plan

Refer to the complete description of this measure in Impact TR-1, above.

With the implementation of MM TR-1, potential impacts on pedestrian and bicycle circulation would be reduced to a less-than-significant level.

Utilities and Service Systems

3.13.1 Introduction

This chapter summarizes the potential for utilities and service systems to be affected by implementation of the Proposed Project. Utilities and systems evaluated include water, recycled water and wastewater, stormwater, solid waste management, power, and other services. The chapter also provides a description of the regulatory setting and affected environment for utilities and service systems, and an analysis of impacts on utilities and service systems resulting from construction of the Project. No new permanent demand for utilities and service systems would be generated by the Proposed Project. Where feasible, mitigation measures are identified to reduce the level of expected impacts.

3.13.2 Regulatory Setting

Federal Regulations

No specific federal regulations related to utilities and service systems are applicable to the Proposed Project.

State Regulations

California Integrated Waste Management Act of 1989

The California Integrated Waste Management Act of 1989, enacted through Assembly Bill (AB) 939, requires cities and counties to reduce, reuse (including composting), and recycle solid waste generated in the state to the maximum extent feasible before incineration or landfill disposal of waste. AB 939 states that each city and county in the State of California must manage waste disposal through the implementation of a Source Reduction and Recycling element. Under the Source Reduction and Recycling element, counties are required to achieve mandated goals through the implementation of diversion programs.

The state determines compliance with this mandate to divert 50% of generated waste (which includes both disposed and diverted waste) through a complex formula. This formula requires cities and counties to conduct empirical studies to establish a “base year” waste generation rate against which future diversion is measured. The actual determination of the diversion rate in subsequent years is calculated through deduction,

not direct measurement; instead of counting the amount of material recycled and composted, the city or county tracks the amount of material disposed of at landfills, and then subtracts the disposed amount from the base-year amount (PRC § 41780.2). To assist the City of Sunnyvale (City) in achieving the mandated goals, solid waste generated by the Proposed Project should be reduced and reused to the extent feasible.

Title 8, Section 1541 of the California Code of Regulations: Excavations

Section 1541 of the California Code of Regulations requires excavators to determine the approximate locations of subsurface installations, such as sewer, telephone, fuel, electric and water lines, prior to opening an excavation.

California Government Code Section 4216 et seq.

Owners and operators of underground utilities are required by California law to become members of and participate in a regional notification center, so that they will receive notification of planned excavation reports from public and private excavators.

Local Regulations

Santa Clara County Zero Waste 2020 Vision

Santa Clara County (County) developed the “Zero Waste 2020 Vision” to encourage local governments to adopt policies and develop plans that motivate community members to eliminate waste. This vision statement and action plan were developed to provide County jurisdictions with a working document that could be used to guide decision-making policies and programs toward achieving zero waste by 2020. (Santa Clara County Integrated Waste Management Division 2010).

The County’s vision is that, by 2020, all discarded materials in the county will be recovered for their highest and best use, and no materials will be sent to landfills or incinerators. Implementation of Zero Waste actions to achieve the County’s Vision is based on the following guiding principles:

- Waste Reduction: Reduce the Amount of Materials to be Managed; and
- Recycling and Composting: Manage Materials to Minimize Environmental Impacts Downstream, as follows:
 1. All organic materials shall be recovered and productively used;
 2. Recovered materials shall be directed to their highest and best use; and
 3. Materials sent to landfill shall be minimized.

Cities throughout the county have developed and are implementing Zero Waste plans following the County’s guidance. The City of Sunnyvale adopted a Zero Waste Policy in 2008 and is currently developing a Zero Waste Strategic Plan (City of Sunnyvale 2012a).

Santa Clara County General Plan

Santa Clara County has developed the following solid waste management goals in the *Santa Clara County General Plan* (Santa Clara County 1994).

C-RC 63: Santa Clara County shall strive to reduce the quantity of solid waste disposed of in landfills and to achieve or surpass the requirements of state law.

C-RC 64: Countywide solid waste management efforts shall be guided by the hierarchy of strategies outlined below, emphasizing resource recovery in accordance with state law:

- a. Source reduction and reuse,
- b. Recycling and composting,
- c. Transformation, and
- d. Landfilling as final option.

Generally, more than 30% of landfill waste is construction and demolition debris (City of San José 2013). Solid waste generated from construction of the Proposed Project would be subject to this plan.

City of Sunnyvale General Plan

The Environmental Management element of the City of Sunnyvale's 2011 General Plan (City of Sunnyvale 2011) contains the following goals and policies related to utilities and service systems that are applicable to the Proposed Project:

Water Supply

Policy EM-4.3: Provide appropriate security and protection of water facilities.

Solid Waste

Policy EM-15.2: Reduce the amount of refuse being disposed, generate recycling revenues, and minimize truck travel to the disposal site through the use of the Sunnyvale Materials Recovery and Transfer (SMaRT) Station.

3.13.3 Environmental Setting

Buried and aboveground pipes, cables, or other delivery systems for utilities including wastewater, stormwater, potable water, recycled water, power transmission, and telecommunications are present throughout the Project Area. The following utility lines are known to be located within (buried or aboveground) or near the Project Area: Pacific Gas and Electric Company (PG&E) towers, San Francisco Public Utility Commission's (SFPUC's) Hetch Hetchy pipelines, City of Sunnyvale stormwater/wastewater, and water and recycled water pipelines, among others. Numerous utility lines are located throughout the Project Area. The location and depth of these utilities was identified for

the Project design process. However, owing to the large size of the Project Area, the specific location of all utilities is not identified in this section. Known utilities that would be affected by the Project are identified and discussed in the “Environmental Impacts” section, below. The City’s Water Pollution Control Plant (WPCP) and the Sunnyvale Materials Recovery and Transfer (SMaRT) Station are also next to the Project Area. The remainder of this section describes existing utilities and service systems within the Project vicinity.

Solid Waste Disposal

Until 1993, the City operated a landfill west of the West Channel and north of Caribbean Drive, adjacent to the Carl Road to Caribbean Drive reach. Currently, solid waste generated within the City of Sunnyvale is transported to the SMaRT Station. This facility is between the East and West Channels and adjacent and south of Pond A4. Solid waste consists of virtually all material discarded except hazardous wastes, radioactive wastes, medical waste, sewage, or liquids. The SMaRT Station separates recyclable materials and transfers the non-recycled portion to Kirby Canyon Landfill in San José, 27 miles from the Project Area, under an agreement that expires in 2021 (City of Sunnyvale 2011). **Table 3.13-1** summarizes the permitted throughput, estimated remaining capacity, and estimated closure date of Kirby Canyon and other facilities receiving solid waste in Santa Clara County.

The City leases space near the SMaRT Station to a private company that recycles concrete and asphalt. The source of the raw material is typically pavement material generated by roadway and sidewalk repairs or demolition of concrete structures. Because the facility accepts material that would be otherwise disposed of in a landfill, it is an important component of the City’s compliance with the 50% diversion mandate contained in the California Integrated Waste Management Act of 1989 (AB 939). The City’s lease requires the operator to report the jurisdiction of origin of the raw materials and that information is available to the City and other jurisdictions for preparing AB 939 compliance reports (City of Sunnyvale 2011).

The landfill is subject to a Bay Area Air Quality Management District (BAAQMD) permit, which requires an uninterrupted flow of methane gas and condensate from the West Hill landfill to the Landfill Gas Flare Station. A methane gas pipeline extending from the landfill runs along the Carl Road crossing of the West Channel.

Additionally, there are three hazardous waste disposal facilities for the treatment, storage, and disposal of hazardous wastes in California: Chemical Waste Management Inc.’s facility in Kettleman City; Clean Harbors, Buttonwillow; and Clean Harbors, Westmorland. Hazardous wastes generated by the Proposed Project would most likely be disposed of at the Kettleman City facility. These facilities are further discussed in Chapter 3.7, “Hazards and Hazardous Materials.”

Table 3.13-1. Solid Waste Disposal Facilities

Landfill Facility	Maximum Throughput (tons per day)	Remaining Capacity (cubic yards)	Estimated Closure Date¹
Guadalupe Sanitary Landfill (43-AN-0015)	1,300	11,055,000	2048
Kirby Canyon Recycling & Disposal Facility (43-AN-0008)	2,600	57,271,507	2022
Newby Island Sanitary Landfill (43-AN-0003)	4,000	18,274,953	2025
Zanker Material Processing Facility (43-AN-0001)	350	540,100	2018
Zanker Road Class III Landfill (43-AN-0007-01)	1,300	700,000	N/A

Notes: ¹ Determined as the date when maximum capacity is estimated to be reached.
Source: CDRRR 2013.

Wastewater Treatment Facilities

The City's Donald M. Somers WPCP is located at 1444 Borregas Avenue, immediately adjacent to the West Channel/Moffett Channel and Pond A4 (and next to the SMaRT facility). This WPCP treats wastewater from indoor sources in the City of Sunnyvale and discharges effluent directly into the Moffett Channel, where it flows to Guadalupe Slough and eventually the southern portion of San Francisco Bay (City of Sunnyvale 2012b).

Originally constructed in 1956, the WPCP utilizes primary, secondary, and tertiary treatment processes to remove pollutants from the wastewater and produce effluent suitable for discharge to San Francisco Bay (City of Sunnyvale 2012b). The WPCP also uses 440 acres of oxidation ponds located north of Pond A4 for secondary treatment process of the City's wastewater (City of Sunnyvale 2012b). The treatment process includes siphoning and pumping treated water through the series of ponds. An access road for trucks to access percolation ponds and other facilities at the WPCP runs parallel to the west bank of the West Channel. After 30-45 days of secondary treatment, the water is returned to the plant for tertiary treatment and is then discharged into the West Channel/Moffett Channel.

The WPCP has an average dry-weather-flow design capacity of 29.5 million gallons per day (MGD) and a 40 MGD peak wet-weather flow capacity. The actual average effluent discharge to Moffett Channel from 2006 to 2008 was 11.8 MGD (for dry and wet weather), well within the facility's capacity (SWRCB 2009a). The WPCP discharge into Moffett Channel is subject to waste discharge requirements as set forth in National Pollutant Discharge Elimination System (NPDES) Permit # CA0037621, issued by the San Francisco Bay Regional Water Quality Control Board in 2009 (SWRCB 2009a). The WPCP's discharge must meet minimum federal technology-based requirements, based

on Secondary Treatment Standards at 40 CFR 133 and/or Best Professional Judgment pursuant to 40 CFR 125.3. The City must also maintain compliance with effluent limitations for several constituents, at the WPCP discharge point into the West Channel. Lastly, the WPCP is prohibited from certain discharges, such as untreated or partially treated wastewater.

Stormwater Conveyance Facilities

Urban runoff is collected and transported through the City's storm drain system and discharged to local waterways. The Sunnyvale Channels receive stormwater runoff from the City's storm drain system and transport flows north to Guadalupe Slough near Pond A4. The City operates approximately 150 miles of storm drains with two pump stations, which collect runoff from low-lying urban areas and discharge flows to creeks and sloughs at higher elevations (City of Sunnyvale 2011). One of the City's storm drain pump stations is located downstream of Caribbean Drive, along the West Channel (SCVWD 2010). The City's stormwater discharge is subject to regulation set forth in NPDES Permit # CAS612008, the Municipal Regional Stormwater Permit adopted for the San Francisco Bay region (SWRCB 2009b). The City aims to reduce and treat runoff and currently adheres to Urban Runoff Best Management Practices (BMPs), and the City is transitioning from a conveyance stormwater system to an infiltration approach often referred to as Low Impact Development (City of Sunnyvale 2011).

Water Transmission Pipelines

Several sources of potable water enable the City to meet its demands. There are local City-owned and operated groundwater wells, as well as imported supplies from SFPUC and the District. Water supply transmission pipelines run along and across the Sunnyvale Channels. There are four SFPUC Hetch Hetchy pipelines, commonly referred to Bay Division Pipelines (BDPL) Nos. 1, 2, 3, and No. 4. Pipelines 1 and 2 cross the San Francisco Bay to the south of the Dumbarton Bridge and are not within the vicinity of this Project. BDPL No. 3 and No. 4 cross beneath the East Channel, just north of the channel crossing with U.S. Highway (Hwy) 101, and run adjacent to and cross beneath the West Channel from Ross Drive to Almanor Avenue. BDPL No. 3 is a 72-inch reinforced concrete underground pipeline while BDPL No. 4 is a 90-inch reinforced concrete underground pipeline. Both pipelines typically traverse within a minimum 80-foot wide right of way, parallel to one another, separated from centerline to centerline by approximately 15 feet. The BDPL depths vary as they traverse below rivers, streams, channels, highways, structures, etc. from Hetch Hetchy Reservoir in Yosemite National Park to Crystal Springs Reservoir near the City of San Francisco.

The District supplies water from the Sacramento–San Joaquin Delta via the State Water Project and the Central Valley Project to the City of Sunnyvale. The City's transmission lines run adjacent to the Sunnyvale Channels and over several channel roadway crossings. In addition, the City uses recycled water for non-potable uses, such as

landscape irrigation and industrial processes. The City operates recycled water transmission lines that run adjacent to the Sunnyvale Channels and over several channel roadway crossings. These pipes carry high-quality, non-potable water produced through the tertiary process at the WPCP.

Other Utilities

PG&E provides natural gas and electric power throughout the City of Sunnyvale. PG&E power lines run overhead throughout much of the Project Area. Several PG&E towers are within the channel easements. In some locations, the concrete tower footings and abutments are located directly on and along the channel bank. PG&E lines are also buried beneath the Sunnyvale Channels. In addition, a number of companies provide telephone and data transmission within the City, such as AT&T.

3.13.4 Impact Analysis

Criteria for Determining Significance

For the purposes of this analysis, the Proposed Project would result in a significant impact on utilities and service systems if it would result in a need for new, relocated, upgraded, or expanded utilities and service system facilities that could cause significant environmental impacts in order to maintain acceptable service levels or other performance objectives for:

- a) Water;
- b) Wastewater/Reclaimed Water;
- c) Stormwater;
- d) Solid Waste;
- e) Streets and roadways;
- f) Power systems (e.g., electricity, natural gas);
- g) Other utility systems; or
- h) Would the project have sufficient water supplies available to serve the Project from existing entitlements?

Topics Dismissed in the Initial Study Checklist

The Initial Study Checklist (IS) dismissed potential impacts on roadways from further analysis because there would be no additional need for new, updated, or expanded roadways during or after Project construction. The IS dismissed potential impacts on water supplies because the Project would only use a small, insubstantial amount of

water for dust control, mixing of concrete, vehicle cleaning, and possibly for other construction-related activities.

Methodology

The Proposed Project would not generate any wastewater requiring treatment or use or demand any water supplies. The analysis focuses on temporary construction-related impacts. Impacts of the Proposed Project were evaluated qualitatively, based on the potential for the Project to disrupt existing utilities and service systems. This impact discussion is based on applicable state regulations and local policies. Information gathered from field surveys and project design was used for analysis of potential impacts.

Project maintenance would occur as needed and may require maintenance activities, such as sediment removal and vegetation management, from within the Sunnyvale Channels, which could impact utilities and service systems. Potential impacts due to stream maintenance activities are addressed by the District's Stream Maintenance Program Subsequent EIR (refer to Chapter 2.0, "Project Description"). The Stream Maintenance Program Final Subsequent EIR is available for review online: <http://valleywater.org/SMPSEIR2011.aspx> . See Volume 2, Chapter 3, Section 3.10 for the Public Services and Utilities impact discussion.

Environmental Impacts

The impact discussions below are structured as follows. First, the environmental impacts of the Proposed Project in the absence of BMPs are discussed. The discussion then presents applicable District BMPs that would avoid or minimize the level of impact. A conclusion regarding the significance of the environmental impact is then made (considering implementation of the District BMPs, as applicable). If the impact would be significant even with use of BMPs, mitigation measures (MMs) are prescribed. The residual significance of each impact following application of the MMs is then provided.

Impact UTL-1: Temporary Disruptions to Water, Wastewater, Stormwater, Power Systems and Other Utility Systems during Project Construction Activities – Less than Significant with Mitigation

Any of the utility delivery systems described in the preceding "Environmental Setting" section could potentially experience a disruption in service if Project construction activities intentionally remove or accidentally damage a utility distribution or transmission system. Preliminary information for the location and depth of utility transmission systems was identified during the Project design process. Using this information, the District has already taken several measures to reduce the potential for disruptions to existing utilities.

Known Utilities

The Project has been designed to avoid known underground concrete storm drains, drop inlets, and electrical conduits located within or abutting the channels, such that the utilities would not be disturbed. The District has designed floodwalls such that excavation would avoid these known buried utilities. Prior to final engineering design, the District would confirm the location of known utilities. Levee raising and enlargement, floodwall ramps, and maintenance road improvements would occur at the ground surface, outside of the channels and roadway crossings where the potential to disturb existing utilities is minimal. These components would avoid disturbance of drop inlets located at the ground surface.

In-channel construction activities for rock slope protection, wingwall and outfall bank stabilization, and the concrete-lined channel are not expected to encounter existing utilities. Existing stormwater outfalls would be encountered within a channel where failed sack-concrete slope protection is in need of replacement. Such an activity is part of the Proposed Project, and in such a case the outfall would be repaired as part of the slope protection. In channel excavation for rock slope protection and sediment removal would extend down to 2.5 feet, a very shallow depth. Encountering unknown buried utilities at this shallow depth is highly unlikely. Some erosion protection and bank stabilization activities would occur where PG&E towers are located. The channel banks in these areas would be reinforced, which would reduce the likelihood of future bank or footing failures in the vicinity of the electrical towers.

Bridge and Culvert Modifications

The Project would affect existing utilities where bridges/culverts would be replaced or culverts would be extended. No conflicts are anticipated for other bridge/culvert modifications, including where headwalls would be raised. **Table 3.13-2** provides details of existing utilities that the District knows would need to be protected in place or relocated during bridge/culvert modifications. With regard to utilities that would be replaced, Table 3.13-2 provides information about the utilities' temporary location during construction, if required, and new location after construction. During the culvert extension at West Java Drive on the West Channel, a few utility alignments would need to be protected in place. During bridge/culvert reconstructions, several utilities extending across Carl Road (West Channel) and Caribbean Drive (East Channel) would need to be removed and replaced.

The District would temporarily relocate the majority of utilities affected during bridge/culvert modifications. The District intends to avoid or minimize interruption of service with regard to water, recycled water, wastewater, and stormwater conveyance, and with regard to power and telecommunications utility lines replaced by the Project. However, avoidance or minimization of impacts on utility services to a level acceptable by the utility owner cannot be guaranteed without careful coordination with the utility owner.

At the Carl Road bridge crossing of the West Channel, the District proposes temporary relocation and replacement of an 8-inch methane gas pipeline from the City's landfill. As discussed in the "Environmental Setting" section above, BAAQMD requires uninterrupted flow of methane gas from the station. The District has disclosed to the City that this gas line would be affected during reconstruction of the Carl Road bridge.

A few utilities would be reinstalled after construction, resulting in interruption of service during the Project's construction period, but these utilities are limited to irrigation lines or weather stations in the roadway median. Since these utilities do not provide critical water, wastewater, or electrical services, it is expected that the interruption in service would be manageable and acceptable to the utility operator.

Unknown Utilities

Owing to the large size of Project Area and the extensive number of utility transmission systems crossing the City of Sunnyvale, it is possible there are unknown utilities traversing the Project Area. All Project construction activities could potentially affect unknown utilities at the Project Area. The District has attempted to identify all or most known utilities at the ground surface and attached to or within channel roadway crossings because these utilities are visible or mapped and easy to identify. It is most likely that unknown utilities are buried underground. As such, excavation activities for floodwalls are expected to have the greatest potential to affect unknown utilities.

Applicable District Best Management Practices

No District BMPs are applicable to this impact.

Conclusion

The District would protect in place and replace several utilities at channel roadway crossings during construction of bridge/culvert modifications (Table 3.13-2). While the District intends to avoid or minimize impacts on utility services, reducing service impacts to a level acceptable by the utility owner cannot be guaranteed. In addition, Project construction has the potential to affect unknown utilities traversing the Project Area. For these reasons, this impact is considered potentially significant. The District would implement the following mitigation measures (MMs) to identify unknown utilities and coordinate the replacement of affected utilities with utility owners.

Table 3.13-2. Existing Utilities Affected by Project Construction

Utility: Type & Size	Owner	Existing Utility Location	Effect to Utility During Project Construction	Relocation of Existing Utility (if applicable)	
				Temporary Location (if required)	Permanent New Location
Sunnyvale East Channel, Caribbean Drive					
12-inch reclaimed water (RW) pipeline	City of Sunnyvale	Downstream (d/s) face of bridge	Temporary relocation during bridge reconstruction	Routed through a temporarily pipeline, fixed to a steel I-beam and suspended over the channel 20 feet d/s of the bridge	D/S face/headwall of reconstructed bridge
Underground gas main (size unknown)	Pacific Gas and Electric (PG&E)	15 feet d/s of WB Bridge (UG)	Load/equipment weight restrictions above facility	-	-
Two 3-inch steel conduits	Unknown	D/s face of bridge	Temporary relocation during construction	D/s face of the reconstructed bridge	Within center median of reconstructed bridge
Median plant irrigation lines (expected .75- to 1-inch)	City of Sunnyvale	Within bridge median	Removed and reinstalled after bridge reconstruction	-	-
Misc. items, FH, weather station	City of Sunnyvale	Within bridge median	Removed and reinstalled after bridge reconstruction	-	-
12-inch water pipeline	City of Sunnyvale	D/s face of bridge	Relocation during bridge reconstruction	-	Upstream (u/s) face of the reconstructed bridge
Two 3.5 inch conduit-cement (C-CEM)	AT&T	U/s face of bridge	Temporary relocation during bridge reconstruction	Routed through a temporarily pipeline, fixed to a steel I-beam and suspended over the channel 20 feet u/s of the bridge	Attached to the u/s face of, or within sleeve attached to, the reconstructed bridge
Sunnyvale West Channel, Carl Road					
8-inch HDPE Landfill Gas Header with concrete cap	City of Sunnyvale	Buried (2 feet cover) on top of existing bridge	Temporary relocation during bridge reconstruction	Routed through a temporarily pipeline, fixed to a steel I-beam and suspended over the channel 10 feet u/s of the bridge	Attached to the face of, or within sleeve attached to, the reconstructed bridge
Two 2-inch Condensate Collection and Return System lines	City of Sunnyvale	Buried (2 feet cover) on top of existing bridge	Temporary relocation during bridge reconstruction	Routed through a temporarily pipeline, fixed to a steel I-beam and suspended over the channel 10 feet u/s of the bridge	Attached to the face of, or within sleeve attached to, the reconstructed bridge

Utility: Type & Size	Owner	Existing Utility Location	Effect to Utility During Project Construction	Relocation of Existing Utility (if applicable)	
				Temporary Location (if required)	Permanent New Location
Sunnyvale West Channel, West Java Drive					
Numerous existing utilities	Various	On both the u/s and d/s faces of existing bridge/culvert	None; protect in place during culvert extension	-	-
Light Rail Facilities	Santa Clara Valley Transportation Authority	Center bridge median	None; protect in place during culvert extension	-	-

Notes: Utilities above and beneath the Project Area and not shown on this table are not anticipated to be affected by Project construction.

Mitigation Measure UTL-1: Existing Utilities will be Identified and Coordination will be Conducted with Utility Owners before Construction

The District shall ensure that construction contractors for the Project perform the following:

- The Contractor shall notify Underground Service Alert (USA) a minimum of 5 working days prior to start of excavation or demolition.
- The Contractor shall verify the exact location of all indicated or field marked utilities and make a sufficient number of exploratory excavations of all utilities that may interfere with the work sufficiently in advance of the construction. Contractor shall perform exploratory excavations in the presence of the owner of the utility to be explored. Contractor shall promptly notify the Engineer when such exploratory excavations show the utility location as shown on the drawings to be in error.
- The Contractor shall not interrupt the service function or disturb the support of any utility without authority from the utility owner or order from the Engineer. All valves, switches, vaults, and meters shall be maintained and be readily accessible for emergency shutoff.
- The District and the owners of utilities or their authorized agents may enter upon the rights of way at all times for the purpose of operations and maintenance of their facilities or for making necessary connections or repairs to their properties. The Contractor shall cooperate with the District and the affected utilities engaged in such work to avoid any unnecessary delay or hindrance to such work.
- The Contractor shall maintain a list of telephone numbers of owners of utilities that may be encountered during construction.
- The Contractor shall coordinate work near utilities and protect utilities during construction. Where it is known or anticipated that an existing utility will be encountered during construction, the Contractor shall be responsible for notifying and/or coordinating with the utility owner using the appropriate drawings at least 5 working days in advance of work in which the utility will be involved.

Mitigation Measure UTL-2: Existing Utilities will be Protected during Construction.

The District shall ensure that construction contractors perform the following:

- The Contractor shall do all work and furnishing all materials required for protecting in place or restoring all existing above and below ground utilities disturbed or damaged during construction to a condition equal to or better than that existing prior to construction.

- The Contractor shall protect all utilities which may be impacted by the work. All exposed utilities shall be supported firmly and uniformly, conforming to the utility requirements. No utilities shall be left exposed for a period exceeding 8 hours unless approved by the utility and the Engineer. Unless otherwise shown on the drawings, all utilities shall be backfilled with at least 12 inches of select backfill.
- All utility pole and guy anchors shall be protected and, where the walls of the trench are within 5 feet of a pole or anchor, lateral support to the pole shall be provided or a State of California licensed Structural Engineer designs an alternative measure that is acceptable to the District Engineer.
- The Contractor shall immediately notify the utility owner and the Engineer if any existing utilities which have sustained damage prior to excavation, or if the plan for protection of open bodies of water from contamination for Engineer's review.

Mitigation Measure UTL-3: Utility Customers will be Notified before Construction Activities Commence.

The District's Contractor is required to notify USA a minimum of 5 working days prior to the start of excavation or demolition. Depending on the utility company, each company has minimum notifications requirements when notifying residents and businesses of interruptions to existing service. District's Contractor must comply with these minimum notification requirements set forth by the utility companies. The notification will include the timing and duration of potential service disruption.

The District will conduct separately public outreach to notify the residents and businesses in the vicinity of the Project limits, a minimum of two (2) weeks prior to the start of Project's construction.

Mitigation Measure UTL-4: A Safety and Health Program will be Prepared and Implemented.

In compliance with Title 8 CCR, Section 5192, the District shall ensure the development and implementation of a written safety and health program and a site-specific Safety and Health Plan for construction contractors. The safety and health program shall be designed to identify, evaluate, and control safety and health hazards, and provide for emergency response for hazardous waste operations, including events such as a leak or explosion resulting from damage to a utility. In addition, the District shall notify local fire departments whenever damage to any utility is a threat to public safety.

The District shall ensure that the Safety and Health Plan is implemented by the provision of any and all training, monitoring, personal protective equipment, protective clothing, devices, equipment, and/or facilities necessary for ensuring

worker safety as may be recommended and/or specified in the Safety and Health Plan.

Furthermore, the District shall ensure that all construction contractor personnel understand and comply with all site health and safety requirements specified in the Safety and Health Plan.

With implementation of these MMs, potential damage to existing utilities and service disruptions would be minimized by coordinating with utility owners and adhering to construction specifications in the Project design plan. The Safety and Health Plan would further diminish impacts from any damage that occurs. Impacts on utilities and service systems in the Project Area would be less than significant with mitigation.

Impact UTL-2: Adequate Landfill Capacity to Accommodate Solid Waste from Construction – Less than Significant

Construction of the Proposed Project would generate solid waste, some of which would require disposal at a landfill. In Table 2-6 (in Chapter 2, "Project Description"), "material exports" represent the amount of waste generated by Project construction that would require disposal at a landfill.

Excavated earthen materials would first be considered for reuse by the District, to the extent feasible. Soil and sediment excavated during Project construction is proposed for on-site reuse in the construction of other Project components. It is estimated that 31,650 cubic yards of earthen material (Table 2-6) from floodwall excavation would be reused on-site in the construction of floodwall ramps, installation of floodwalls, and levee enlargement and raising. Excavated soil reused on-site would not require disposal at a landfill. Some sediment excavated from the channel for rock slope protection would be reused in the channel as back-fill between rocks installed for rock slope protection. However, some soil excavated from the channel would not qualify for reuse on-site.

Non-hazardous solid materials that would not be reused on-site would require disposal at a landfill. If soil or sediment is identified as contaminated, disposal at a hazardous materials facility would be necessary (refer to Impact HAZ-1 in Section 3.7, "Hazards and Hazardous Materials"). The District estimates that the Project would generate construction waste of approximately 75,630 cubic yards of material, including 2,100 cubic yards of concrete debris, 72,660 cubic yards of sediment (excluding sediment reused on-site), and 870 cubic yards of vegetation (Table 2-6). This amount of solid waste would be generated temporarily. No long-term, annual solid waste generation would occur as a result of the Project.

A significant impact to landfill capacity would result if waste generated by the Project were to exceed available capacity of local waste disposal facilities. Disposal of solid waste would take place in a phased approach over the 2 years of the Project's construction. At the time of the Proposed Project's implementation, the District and its selected construction contractor would determine which facility would receive

construction waste. This could include any of the facilities listed in Table 3.13-1. Local landfills (refer to Table 3.13-1) have available permitted capacities ranging from 540,100 cubic yards to 57,271,507 cubic yards, with expected site lives of 5–35 years. These landfills have adequate capacity to receive solid waste generated during Project construction. Furthermore, since multiple landfills are accessible to the Project Area, solid waste generated during construction could be disposed of at multiple facilities, thereby reducing the effect on the capacity of any single facility.

Applicable Best Management Practices

The District would implement BMP UT-2 to reuse or recycle solid waste to the extent possible. A description of this BMP is provided in Table 2-8 in Chapter 2, “Project Description.”

BMP UT-2: Solid Waste Management Plan

Conclusion

Any landfill accessible to the Project Area would have the necessary capacity to receive solid waste generated during Project construction. With the implementation of BMP UT-2, solid waste would be reused or recycled to the extent possible, thereby reducing the amount of solid waste generated by the Project and requiring disposal at a landfill. The Project’s impact on landfill capacity is considered less than significant.

Impact UTL-3: Temporary Effects on Operational Vehicle Access to the City of Sunnyvale SMaRT Station and Water Pollution Control Plant (and Associated Facilities) – Less than Significant

Construction of the Proposed Project would potentially interfere with truck access to ancillary facilities associated with the City’s SMaRT Station and the WPCP. The City must be able to access the landfill to monitor the landfill gas and condensate collection systems. Also, the City operates a minimum of three truck trips every day of the week for solid waste operation downstream of Carl Road. Access to this reach would be temporarily prohibited during construction of the levee enlargement between Carl Road and Caribbean Drive; however, the District has coordinated with the City to find an alternate route to the west of the City’s Landfill. The City would likely travel west/north on Caribbean Drive and west on 1st Avenue. Therefore, the City’s operation of facilities associated with the WPCP and landfill facilities would not be interrupted. This is considered a less than significant impact.

Applicable Best Management Practices

No District BMPs are applicable to this impact.

Conclusion

Because the City’s operation of facilities associated with the WPCP and landfill facilities would not be interrupted, this impact is considered less than significant.

Other Statutory Requirements

4.1 Introduction

This chapter discusses irreversible impacts, significant and unavoidable impacts, growth-inducing impacts, and cumulative impacts as required by the State CEQA Guidelines.

4.2 Significant and Unavoidable Impacts

State CEQA Guidelines Section 15126.2(b) requires an EIR to describe any significant impacts that cannot be mitigated to a level of insignificance. The District would implement best management practices (BMPs) as a part of the Proposed Project. All of the impacts associated with the Proposed Project would be reduced to a less-than-significant level through the implementation of identified mitigation measures, with the exception of the impacts discussed below.

The following impacts have been identified as significant and unavoidable. Please refer to the impact sections in Chapter 3, “Environmental Setting and Impact Analysis,” for a full description of these impacts.

- **Impact AIR-3:** Result in a Cumulatively Considerable Net Increase of any Criteria Pollutant for Which the Project Region is Non-Attainment
- **Impact NO-2:** Temporary Groundborne Vibration Resulting in Building Damage or Annoyance in the Project Area
- **Cumulative Impact AIR-1:** Temporary Cumulative Increase in NO_x, ROG, and Exhaust and Particulate Matter PM₁₀ and PM_{2.5} from Construction Activities

4.3 Growth Inducement

State CEQA Guidelines Section 15126.2(d) requires an EIR to include a detailed statement of a proposed project’s anticipated growth-inducing impacts. The analysis of growth-inducing impacts must discuss the ways in which a proposed project could foster economic or population growth or the construction of additional housing in the project area. The analysis must also address project-related actions that, either individually or cumulatively, would remove existing obstacles to population growth. A project would be considered growth-inducing if it induces growth directly (through the construction of new housing or increasing population) or indirectly (increasing employment opportunities or eliminating existing constraints on development). Under CEQA, growth is not assumed to be either beneficial or detrimental.

The Proposed Project would not involve the construction of new housing, and it would not generate any long-term employment opportunities that could cause substantial population growth. The Project would provide 100-year riverine flood protection to an estimated 1,629 properties adjacent to the Sunnyvale Channels. As a result of the Proposed Project, flood insurance rates are expected to decrease for these parcels. Decreased flood insurance rates could make development of currently undeveloped parcels more desirable. However, the flood management benefits of the Proposed Project are not expected to be a determining factor in development of land parcels that are currently undeveloped as a result of the decrease in flood insurance rates. As such, the Proposed Project is not anticipated to induce population growth.

4.4 Cumulative Impacts

A cumulative impact refers to the combined effect of “two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts” (State CEQA Guidelines § 15355). Cumulative impacts reflect “the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probably future projects. Cumulative impacts can result from individually minor but collectively significant project effects taking place over a period of time” (CEQA Guidelines § 15355(b)).

Under CEQA, an EIR must discuss the cumulative impacts of a project when the project’s incremental contribution to the group effect is “cumulatively considerable.” An EIR does not need to discuss cumulative impacts that do not result in part from the project evaluated in the EIR. State CEQA Guidelines (§ 15130(a)) require that an EIR address the cumulative impacts of a proposed project when:

- The cumulative impacts are expected to be significant; and
- The project’s contribution to the cumulative impact is expected to be cumulatively considerable, or significant in the context of the overall (cumulative) level of effect.

To meet the adequacy standard established by the State CEQA Guidelines (§ 15130), an analysis of the cumulative impacts must contain the following elements:

- An analysis of related future projects or planned development that would affect resources in the project area similar to those affected by the proposed project.
- A summary of the environmental effects expected to result from those projects with specific reference to additional information stating where that information is available.
- A reasonable analysis of combined (cumulative) impacts of the relevant projects.

- An evaluation of a proposed project's potential to contribute to the significant cumulative impacts identified, and discussion of feasible options for mitigating or avoiding any contributions assessed as cumulatively considerable.

The discussion of cumulative impacts is not required to provide as much detail as the discussion of the effects attributable to the project alone. Rather, the level of detail should be guided by what is practical and reasonable. In addition, the State CEQA Guidelines (§ 15130(e)) directs that if a cumulative impact was adequately addressed in a prior EIR for a general plan, and the proposed project is consistent with that general plan, the project EIR need not further analyze that cumulative impact.

4.4.1 Methods Used in this Analysis

Section 15130 of the State CEQA Guidelines provides two recommended approaches for analyzing and preparing an adequate discussion of significant cumulative impacts. The approaches as defined in Section 15130 of the State CEQA Guidelines are either:

- the list approach, which would involve listing past, present, and reasonably probable future projects producing related or cumulative impacts, including those projects outside the control of the lead agency; or
- the projection approach, which utilizes a summary of projections contained in an adopted general plan, a related planning document, or an adopted environmental document that evaluated regional or area-wide conditions contributing to the cumulative impact.

This evaluation utilizes the list approach for the cumulative impact analysis. The level of detail of a cumulative impact analysis should consider a proposed project's geographic scope and other factors (e.g., a project's construction or operation activities), to ensure that the level of detail is practical and reasonable. The discussion focuses on the potential cumulative impacts of the Project for relevant resource areas analyzed in previous chapters.

Projects with the potential to contribute to the same cumulative impacts as the Proposed Project are to a large extent within close geographic proximity to the Project Area. Several of these projects also have construction activities occurring at the same time as the Proposed Project. **Table 4-1** defines the geographic scope that will be used in the impact analysis for each resource area.

Table 4-1. Geographic Scope for Resources with Potential Cumulative Impacts

Resource	Scope
Air Quality	San Francisco Bay Area Air Basin (SFBAAB)
Biological Resources	Sunnyvale Channels, the Guadalupe Slough, San Francisco Bay, and the Pacific Ocean
Greenhouse Gas Emissions	Global
Hazards and Hazardous Materials	Project Work Area and surrounding areas in the City of Sunnyvale
Noise and Vibrations	Project Work Area and surrounding areas exposed to noise and vibrations generated in the Project Work Area; primarily within the City of Sunnyvale
Recreation	Recreational facilities, primarily within the City of Sunnyvale
Traffic and Transportation	Roadways with traffic generated by the Proposed Project; primarily within the City of Sunnyvale
Water Quality	Sunnyvale Channels, Guadalupe Slough, and South San Francisco Bay

Table 4-2 lists projects that would occur throughout Santa Clara County that could affect resources similar to those affected by the Proposed Project. The list was developed by reviewing CEQAnet, an online database of CEQA documents (including proposed projects), the District's Five-Year Capital Improvements Program list, project reference documents, scoping period comments (provided in **Appendix A**), and results from an inquiry with the City of Sunnyvale (Chu, pers. comm., 2013). While not every potential cumulative project is likely listed, the list of cumulative projects is considered comprehensive and representative of the types of impacts that would be generated by other projects related to the Proposed Project. The cumulative impact evaluation assumes that the impacts of past and present projects are represented by baseline conditions, and cumulative impacts are considered in the context of baseline conditions alongside reasonably foreseeable future projects.

Table 4-2. List of Reasonably Foreseeable Future Projects that May Cumulatively Affect Resources of Concern for the Proposed Project

Project Title	Brief Project Description
Planned Projects near the Sunnyvale Channels Project Area	
Great America Expansion Project	This project is located at the corner of Mission College Boulevard and Great America Parkway in Santa Clara. The project proposes to rezone a parcel to allow construction of an office campus development. An existing office building will be demolished, and up to about 718,000 square feet of office/research and developed space will be constructed. Structured parking will also be constructed to provide adequate onsite parking capacity.
Route 82 Curb Ramp Project	This project would repair curb ramps and construct drainage improvements to improve public safety, mobility, and access.
Resurfacing with Asphalt Concrete on SR 82	This project would resurface a portion of SR 82 with asphalt concrete.
3515 - 3585 Monroe Street Mixed Use Project	This project would demolish 4 industrial office buildings totaling 275,000 square feet in area, and replace them with a new mixed-use development of 602 residential units, and 53,000 square feet of retail commercial building area. The project is located at the corner of Monroe Street and French Street in the City of Sunnyvale.
645 Almanor Avenue ARC TECH renovation	This project would complete renovation of an office/research & development facility at 645 Almanor Avenue. The project is located at the corner of Almanor Avenue and N. Mathilda in the City of Sunnyvale.
Foothill-De Anza Community College District Educational Center	The Foothill-De Anza Community College District is proposing to construct an educational center within the Onizuka Air Force Station redevelopment plan area. The project would be constructed on a 9.2 acre site at the corner of Innovation Way and North Mathilda Avenue in Sunnyvale.
Northern Regional Connector Pipeline	The Northern Regional Connector is a 16,000-foot pipeline that would connect to the existing South Bay Water Recycling 30-inch pipeline on Lafayette Street at Tasman Drive. The pipeline would travel north and west through the Cities of Santa Clara and Sunnyvale with creek crossings including San Tomas Aquinas Creek and Calabazas Creek. The pipeline would tie into the existing 24-inch pipeline on the east bank of the Sunnyvale East Channel.
City of Sunnyvale Water Pollution Control Plant (WPCP) Oxidation Pond Maintenance Project	The City of Sunnyvale’s WPCP has 440 acres of oxidation ponds that are used for secondary treatment (to remove dissolved and suspended solids) of the City’s wastewater. The WPCP ponds are located northwest of the WPCP and north of the Moffett Channel outfall and Pond A4 (adjacent to the Sunnyvale Channels Project Area). The Oxidation Pond Maintenance Project uses a floating hydraulic suction dredge on the oxidation ponds to remove accumulated biosolids from the ponds’ bottoms. The project is currently occurring, and the pond

Project Title	Brief Project Description
	<p>maintenance dredging activity is expected to be completed by 2016. Minimal impacts to the WPCP and access roads are expected. The volatile solids from the project are not expected to cause odors beyond what normally would occur during the WPCP's biosolids drying and handling process.</p>
<p>Moffett Place Project</p>	<p>This project would modify the existing Moffett Park Specific Plan for eight parcels planned as Moffett Park Industrial to Moffett Park Transit Oriented Development. The project is located north of Moffett Park Drive, south of the West Channel, west of Borregas Avenue and east of North Mathilda Avenue. The preliminary project includes the construction of 6 new buildings, amenities building, and structures and surface parking plus a new street between Mathilda and Bordeaux.</p>
<p>San Francisco 49ers Santa Clara Stadium Project</p>	<p>The San Francisco 49ers Santa Clara Stadium project is to construct a 68,500 seat open-air stadium for the San Francisco 49ers and a new parking structure adjacent to the team's existing training facility. The general location is the area bounded by Highway 101, State Route 237, Lawrence Expressway, and the Guadalupe River in the City of Santa Clara. The four specific components of the project are the stadium, off-site surface parking, substation relocation, and a parking garage. The stadium is currently under construction and is planned for completion by fall 2014.</p>
<p>549 Baltic Way NetApp Expansion</p>	<p>This project would redevelop two parcels, known as Site 3, within the Moffett Park industrial area with two 5-story office buildings as part of the expansion of the NetApp campus. The office buildings are designed to meet at least the LEED Gold standard. The project site is located north of Baltic Way, south of Caribbean Drive, and west of the East Channel.</p>
<p>610 E. Weddell Dr. Residential development</p>	<p>This project would construct approximately 200 apartments on a 4.04 acre property located at the southeast corner of Fair Oaks Avenue and Highway 101, and bordered on the east by the East Channel. The site is currently occupied by a vacant single-story industrial building. The project has initiated a General Plan Amendment study to allow consideration of a land use designation change from Industrial to Very High Density Residential.</p>
<p>Peery Park Specific Plan, City of Sunnyvale</p>	<p>Peery Park is located near Moffett Federal Airfield and the industrial office area of Mountain View. Peery Park is generally bounded on the north by U.S. Highway 101, the south by the railroad, the west by the City of Mountain View border and the east by Mathilda Avenue. The site is proposed for the development of Class A office buildings.</p>

Project Title	Brief Project Description
<p>Old Mountain View-Alviso Road Bridge Replacement at Calabazas Creek. City of Sunnyvale and Santa Clara County</p>	<p>A 2005 Caltrans Bridge Inspection Report indicated the Old Mountain View-Alviso Road Bridge over Calabazas Creek was structurally deficient, and will eventually be replaced. The vision for the replacement bridge is one that is wider, to allow sidewalks and bicycle lanes across both sides of the bridge along with street lighting. The bridge deck will be raised to satisfy District requirements for freeboard above the high water flow elevation of the creek. Replacement of the bridge will support the City's existing land use and transportation policy.</p>
<p>Other Cumulative Projects</p>	
<p>South Bay Salt Ponds Restoration Project</p>	<p>This project encompasses approximately 15,100 acres of former salt ponds and is the largest wetlands restoration project on West Coast. The goals of the project are to restore and enhance a mix of wetland habitats, provide wildlife-oriented public access and recreation, and provide for flood management in the South Bay. The project encompasses three different pond complexes along the South Bay shoreline: Alviso, Ravenswood and Eden Landing. The Alviso complex of ponds is north of the City of Sunnyvale. Construction on the Alviso area is complete with the exception of ponds A17 and A18, north of the City of San Jose.</p>
<p>Sunnyvale Land Use and Transportation Element (LUTE) Update and Climate Action Plan (CAP)</p>	<p>The LUTE update establishes the fundamental framework for how streets and buildings will be laid out in Sunnyvale and how various land uses, developments, and transportation facilities will function together. The LUTE includes a series of land use and transportation policies, action statements, and strategies that provide direction for how much the City will change and grow between now and the City's planning horizon of year 2035, and where the growth will take place. The CAP serves as a guiding document to identify ways in which the community and City can reduce greenhouse gas emissions and adapt to the effects of climate change. The CAP addresses long-term goals of emissions reduction and sets reduction targets for the City. The CAP provides measures that will help reach these reduction targets and achieve consistency with the state's Global Warming Solutions Act (AB 32).</p>
<p>San Francisco Bay Shoreline Flood Protection</p>	<p>The South San Francisco Bay Shoreline Study is a congressionally authorized study being performed by the U.S. Army Corps of Engineers together with the California Coastal Conservancy, the Santa Clara Valley Water District, and other local sponsors to identify and recommend one or more projects for Federal funding. The Corps is considering projects that will reduce flood risk, restore ecosystems and provide related benefits like recreation and public access. The first feasibility study investigates flood risk management for all Santa Clara County Baylands, from Palo Alto to Southern Alameda County, in addition the restoration of former salt-production ponds within the Alviso Pond complex and adjacent properties such as areas around Moffett Field.</p>

Project Title	Brief Project Description
Onizuka Air Force Station Redevelopment Plan	The Onizuka Air Force Station Redevelopment Plan is a Reuse Plan for the Onizuka Air Force Station consisting of 52,000 square feet of office space, 70,000 square feet of research and development space, and a community college campus with a peak population of 1,000 students. The project is located within the Moffett Park Specific Plan area and is bounded by Innovation Way to the west and north, Mathilda Avenue to the east, and West Moffett Park Drive to the south.
Santa Clara Valley Transportation Plan 2030 (Santa Clara Valley Transportation Authority)	The Santa Clara Valley Transportation Plan 2030 is the long-range countywide transportation plan for Santa Clara County. It is intended to provide a planning framework for developing and delivering transportation projects and programs until 2030. The plan identifies existing and future transportation-related needs, considers all travel modes, links land use and transportation planning and decision-making. The ten program areas are: highways, expressways, local streets and county roads, pavement management, sound mitigation, landscape restoration & graffiti removal, intelligent transportation systems, transit, bicycles, and livable communities and pedestrians.
City of Sunnyvale Sanitary Sewer Collection System Master Plan	A comprehensive Master Plan is being developed for the City of Sunnyvale’s wastewater collection system, which includes the sanitary sewer and storm drainage components. The plan will define capital projects that will be necessary to replace aging infrastructure, and identify any capacity-increasing projects that may be needed as a result of in-fill development. The master plan will make recommendations for improvements to provide adequate hydraulic capacity and improve the reliability of the collection system. The updated master plan will enable the City to require private developers to pay for sewer capacity increases and/or rehabilitation of existing sewers.
Santa Clara Valley Habitat Conservation Plan	The Santa Clara Valley Habitat Plan provides a framework for promoting the protection and recovery of natural resources, including endangered species, while streamlining the permitting process for planned development, infrastructure, and maintenance activities. The Plan identifies and preserves land that provides important habitat for endangered and threatened species. The land preservation is both to mitigate for the environmental impacts of planned development and public infrastructure operation and maintenance activities and to enhance the long-term viability of endangered species. The study area includes the Santa Clara Valley. The expanded study area for western burrowing owl conservation extends to the northern portion of Santa Clara County, including portions of the City of Sunnyvale.
Santa Clara Valley Water District, Stream Maintenance Program	The District has implemented the Stream Maintenance Program since 2002 to guide routine flood protection maintenance activities within the District’s creeks and canals. The Project Area covers Santa Clara County, in streams below 1,000 feet in elevation. The program objectives are to: remove sediment to maintain the hydraulic, safety, and habitat functions of the creek systems; manage vegetation to maintain the hydraulic, safety, and habitat functions of the creek system, and to allow for levee inspections and maintenance access;

Project Title	Brief Project Description
	<p>stabilize bed and banks of creeks and canals to protect existing infrastructure, maintain public safety, reduce sediment loading, protect water quality, and protect habitat values; and avoid, minimize or mitigate impacts on the environment by incorporating stream stewardship measures into maintenance activities. The Stream Maintenance Program Update covers the 10-year planning period from 2012 to 2022.</p>
<p>City of Sunnyvale Joint Use Agreements with the Santa Clara Valley Water District</p>	<p>The District and City of Sunnyvale may enter into a Joint Use Agreement (JUA) to provide public access to the District’s maintenance roads along the Sunnyvale Channels for recreational use. If a JUA is established, the District would pave several stretches of its existing gravel maintenance roads. The following reaches along the East Channel would be paved: from the John W. Christian Greenbelt to Tasman Drive and from Moffett Park Drive to Caribbean Drive. Maintenance roads along the West Channel from N. Mathilda Avenue to Caribbean Drive would be paved. Paved maintenance roads would comply with specifications for Class I Bike Facilities prescribed the <i>City of Sunnyvale 2006 Bicycle Plan</i> (City of Sunnyvale 2006). No motorized vehicles would be allowed on the paved maintenance road reaches.</p>

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4.4.2 Cumulative Impact Analysis

Cumulative Setting

This section identifies existing impacts considered potentially cumulatively significant in the context of past, present, and reasonably foreseeable future projects with relationship to the potential impacts of the Proposed Project.

Aesthetics

The visual character of the City of Sunnyvale is defined by natural landscape features, primarily within the Baylands in the northwestern portion of the City, which provide open expanses of natural wetland features and vistas of the surrounding region. Development of structures or infrastructure within the Baylands would have the potential to cumulatively degrade the visual character and quality of this area and scenic vistas offered from this area. However, based on the list of cumulative projects in Table 4-2, no other permanent development has occurred recently or is reasonably foreseeable within the Baylands or the areas immediately surrounding Sunnyvale. Therefore, no cumulatively significant aesthetic impacts exist to which the Proposed Project could contribute, and this topic is not discussed further. Direct impacts from the development of the Proposed Project are discussed in Chapter 3.1, "Aesthetics."

Air Quality

The San Francisco Bay Area Air Basin (SFBAAB) has been designated by the Bay Area Air Quality Management District (BAAQMD) as being in nonattainment under state standard for ozone (reactive organic gases [ROG] and nitrogen oxides [NOx]) and particulate matter (PM₁₀ and PM_{2.5}). Under federal standards, the SFBAAB is in nonattainment for 8-hour ozone and 24-hour PM_{2.5}. Several pollutants are undesignated at either the federal or state level: 24-hour PM₁₀ and 1-hour nitrogen dioxide concentrations under federal standards, and hydrogen sulfide and visibility-reducing particles under state standards. As growth occurs in Santa Clara County, increased emissions of these and other pollutants could result in continued nonattainment status or new nonattainment designations. The nonattainment of air pollutant standards in the SFBAAB is considered a cumulatively significant impact. Section 4.5.3 below discusses whether the incremental contribution of air pollutant emissions from Proposed Project activities is considerable in the context of this significant cumulative impact.

Biological Resources

Future development activities in the City of Sunnyvale, the ongoing implementation of the District's SMP, and development activities covered by the Santa Clara Valley Habitat Plan will result in impacts to many of the same habitat types and species that will be affected by the Proposed Project. The list of cumulative projects in Table 4-2 identifies several projects that have been or would be constructed near the Project Area,

potentially impacting biological resources during the same period as the Proposed Project. This is considered a cumulatively significant impact. Section 4.5.3 below discusses whether the incremental effect on biological resources from Proposed Project activities is considerable in the context of this significant cumulative impact.

Cultural Resources

The geographic scope of the cumulative cultural resources analysis is the the Project Area and surrounding environs. The City of Sunnyvale's General Plan contains policies regarding the preservation of important cultural resources (City of Sunnyvale 2011). Ongoing development could lead to the cumulative loss of significant historic, archaeological, or paleontological resources. However, existing City policies are anticipated to be sufficient to avoid or minimize such cumulative impacts. Similarly, the Proposed Project is not anticipated to result in adverse impacts on cultural resources. Thus, in considering the Proposed Project in combination with other projects in the area, no significant cumulative impact on cultural resources would occur. Because there is no cumulatively significant impact to which the Proposed Project could contribute, this topic is not discussed further.

Greenhouse Gas Emissions

As described in Chapter 3.6, "Greenhouse Gas Emissions," anthropogenic emissions of greenhouse gases (GHGs) are widely accepted in the scientific community as contributing to global climate change. GHGs are global pollutants, unlike criteria air pollutants. Global climate change from anthropogenic GHG emissions are projected to cause a variety of negative impacts, including impacts on public health, water supply, agricultural, plant and animal species, and the coastline. The global emissions of GHGs are considered a cumulatively significant impact. Section 4.5.3 below discusses whether the incremental contribution of GHG emissions from Project activities is considerable in the context of this significant cumulative impact.

Hazards and Hazardous Materials

As described in Chapter 3.7, "Hazards and Hazardous Materials," existing and past soil and groundwater contamination are present in the area surrounding the Sunnyvale Channels. In particular, known hazardous waste generating sites and hazardous material spill sites are located adjacent to the Sunnyvale Channels. The majority of these sites are in various stages of remediation. However, public health and safety continue to be threatened by hazardous spill sites. The Proposed Project would utilize hazardous materials and potentially disturb contaminated soil and groundwater. This is considered a significant cumulative impact. Section 4.5.3 below discusses whether the incremental contribution of public and environmental hazards from Project activities is considerable in the context of this significant cumulative impact.

Noise and Vibration

As Sunnyvale grows, the number of noise sources will increase, and ambient noise levels are likely to increase in a variety of locations, particularly in developed areas and along transit corridors. The list of cumulative projects in Table 4-2 identifies several projects that would be constructed near the Project Area, potentially generating noise and vibrations during the same period as the Proposed Project. The combined generation of noise or vibrations is considered a significant cumulative impact on nearby receptors. Section 4.5.3 below discusses whether the incremental contribution of noise from Project activities is considerable in the context of this significant cumulative impact.

Recreation

The City of Sunnyvale's General Plan contains policies to support the City's commitment to maximize access to recreational facilities and programs regardless of income, age, disability, location of residence, or other category. Ongoing development could increase the need for additional facilities (City of Sunnyvale 2011). The list of cumulative projects in Table 4-2 identifies several projects that would be constructed near the Project Area, potentially impacting recreational resources during the same period as the Proposed Project. The effect of these projects on recreational resources, along with the Proposed Project, is considered a significant cumulative impact. Section 4.5.3 below discusses whether the incremental contribution to impacts on recreation from Project activities is considerable in the context of this significant cumulative impact.

Transportation and Traffic

According to the Existing Condition Report for the Land Use and Transportation Element Update of the City's General Plan, all intersections analyzed within Sunnyvale and the intersections evaluated in Santa Clara Valley Transportation Authority's *Congestion Management Plan* within the City operate at an acceptable level of service. However, with increased development and population growth within the City and adjacent areas, traffic conditions may worsen. The list of cumulative projects in Table 4-2 identifies several projects that would generate temporary and permanent new traffic on the same roadways and during the same time period that would be affected by construction of the Proposed Project. The combined generation of traffic would temporarily result in a significant cumulative impact. Section 4.5.3 below discusses whether the incremental contribution of the Proposed Project is considerable in the context of this significant cumulative impact.

Water Quality

Increased development, mostly through redevelopment or more intense densification of urban areas, within the Sunnyvale Channels watershed could lead to a variety of impacts on water resources, including new sources of point sources and non-point source pollution. Because the watershed is already largely built out, the increase in impervious surfaces and volume of stormwater runoff associated with additional

development, redevelopment, or urban densification is not anticipated to change, because RWCQB requires that all new development retain and manage additional runoff onsite. According to the most recent list of water quality impairments under Section 303[d] of the Clean Water Act (CWA), the Sunnyvale Channels and Moffett Channel are not listed as impaired. However, South San Francisco Bay, to which the Sunnyvale Channels drain, is listed as impaired by chlordane, dichlorodiphenyltrichloroethane (DDT), dieldrin, dioxin compounds, furan compounds, invasive species, mercury, polychlorinated biphenyls (PCBs), and selenium from multiple known and unknown sources. Accordingly, under the CWA, South San Francisco Bay has no further assimilative capacity for these pollutants. This is considered a significant cumulative impact.

If the Proposed Project were to discharge these pollutants into the Bay, this would have potential to result in a considerable contribution to this significant cumulative impact. The Proposed Project would potentially disturb contaminated soil and groundwater. This is considered a significant cumulative impact. Section 4.5.3 below discusses whether the incremental contribution of water quality pollutants from Project activities is considerable in the context of this significant cumulative impact.

4.4.3 Cumulative Impacts

Cumulative Impact AIR-1: Temporary Cumulative Increase in NO_x, ROG, and Exhaust and Particulate Matter PM₁₀ and PM_{2.5} from Construction Activities – Significant and Unavoidable

As previously described, given the nonattainment status for particulates (PM₁₀ and PM_{2.5}), NO_x, and ROG in the SFBAAB, the combined emissions of these contaminants by the Project and other projects is considered a significant cumulative impact. Project construction activities would require daily use of construction equipment and vehicles powered by diesel and gasoline fuel, the combustion of which would emit criteria air pollutants, including NO_x, ROG, and exhaust-based PM₁₀, and PM_{2.5}. In addition, Project ground-disturbing activities would release fugitive dust emissions of fine particulate matter—both PM₁₀ and PM_{2.5}.

The thresholds for a significant project-level impact related construction-related emissions are summarized in Table 3.2-2 in Chapter 3.2, “Air Quality”. These thresholds also represent the levels at which a project’s individual emissions of criteria air pollutants, precursors, would result in a considerable contribution to the SFBAAB’s existing air quality impairments.

Emissions estimates of NO_x, ROG, and exhaust-based and fugitive-dust-based PM₁₀ and PM_{2.5} from Project construction are shown in Table 3.2-5 (in Chapter 3.2, “Air Quality”). The average daily emissions of ROG, and exhaust-based PM₁₀ and PM_{2.5} from Project construction are estimated to occur at levels below the identified thresholds for a

considerable contribution. Emissions of NO_x would be emitted by project construction at levels above the threshold. Accordingly, it has been determined that the Proposed Project would emit NO_x at a level that would considerably influence the continued nonattainment status or new nonattainment designations within the SFBAAB. Implementation of MM AQ-1, MM AQ-2, and MM AQ-3 would reduce the amount of NO_x emissions associated with construction of the Proposed Project, but not below the BAAQMD thresholds. Further measures to reduce the NO_x emissions are not considered feasible by the District at this time. Therefore, in considering the Proposed Project in combination with other projects in the area, the Proposed Project's contributions to cumulative air quality impacts would be considerable.

Cumulative Impact BIO-1: Cumulative Impact on Biological Resources – Less than Significant with Mitigation

The Project could potentially affect biological resources through habitat alterations or losses. Project activities would involve floodwall construction, levee modifications, maintenance road modifications, bridge/culvert modifications, rock slope protection, sediment removal, and other modifications. Project's activities would potentially impact a variety of biological resources, including the following:

- temporary disturbance or permanent loss of aquatic and upland natural communities, including a variety of non-special-status plants and animals;
- temporary disturbance or permanent loss of potential habitat for, and loss of individuals of, special-status animals, including:
 - special-status fish (Central California Coast steelhead, longfin smelt, and green sturgeon);
 - special-status reptiles (western pond turtle);
 - special-status birds (bank swallow, bald eagle, California clapper rail, California black rail, California least tern, black skimmer, northern harrier, burrowing owl, loggerhead shrike, yellow warbler, San Francisco common yellowthroat, Alameda song sparrow, Bryant's savannah sparrow, tricolored blackbird, American peregrine falcon, golden eagle, and white-tailed kite);
 - special-status mammals (salt marsh harvest mouse, salt marsh wandering shrew, pallid bat, western red bat, and Pacific harbor seal);
- temporary disturbance or permanent loss of potential nesting habitat for, and active nests of, migratory birds, including raptors; and
- loss of ordinance-sized trees.

The cumulative impact on biological resources resulting from the Project in combination with other projects in the Project Area and larger region would be dependent on the relative magnitude of adverse effects of these projects on biological resources compared to the relative benefit of impact avoidance and minimization efforts prescribed by planning documents, CEQA mitigation measures, and permit requirements for each project; compensatory mitigation and proactive conservation measures associated with each project; and the benefits to biological resources accruing from the adopted habitat conservation plans (HCPs) in the region. In the absence of such avoidance, minimization, compensatory mitigation, and conservation measures, cumulatively significant impacts on biological resources would occur. However, the Sunnyvale General Plan contains conservation measures that would benefit biological resources, as well as measures to avoid, minimize, and mitigate impacts on these resources; the Stream Maintenance Program includes numerous BMPs and mitigation measures to avoid, minimize, and compensate for its impacts; and the Santa Clara Valley Habitat Plan includes numerous conservation measures to offset the adverse effects of covered activities. Similarly, the Sunnyvale Channels Project would implement BMPs and Mitigation Measures BIO-1 through MM BIO-13 to offset its impacts (see Chapter 3.3 “Biological Resources” under Environmental Impacts).

Through BMPs, mitigation measures contained in CEQA documents, and regulatory agency permit conditions (including the conditions of the Santa Clara Valley Habitat Plan), projects in the region will mitigate their contributions to biological resources impacts, reducing cumulative impacts. The Proposed Project would implement a number of BMPs and mitigation measures to reduce impacts on sensitive habitats and to both common and special-status species, as described above. Collectively, implementation of the Project’s mitigation measures would ensure that the Project’s contributions to cumulative impacts on biological resources would not be considerable.

Cumulative Impact GHG-1: Temporary Cumulative Increase in Greenhouse Gases from Construction Activities – Less than Significant

The combined emissions of GHGs from the Project and other projects contributing to global climate change is considered a potentially significant cumulative impact. Project construction activities would require daily use of construction equipment and vehicles powered by diesel and gasoline fuel, the combustion of which would emit GHGs.

As discussed in Chapter 3.6, “Greenhouse Gases,” no numeric construction-related GHG emissions thresholds are available, and thus GHG emissions from Project construction were compared with available numeric operational GHG thresholds. The District has determined that the California Air Resources Board’s (CARB’s) threshold of 7,000 metric tons of carbon dioxide equivalent (MTCO₂e) per year and BAAQMD’s 2010 land-use operational threshold of 1,100 MTCO₂e per year are appropriate to use for purpose of analyzing project-level GHG emission impacts for the Project. The thresholds established by BAAQMD and CARB also represent levels at which a project’s individual

emissions of GHGs would result in a cumulatively considerable contribution to global GHG emissions.

As shown in Table 3.6-1 (in Chapter 3.6, “Greenhouse Gases”), amortized GHG emissions of 58.8 MTCO₂e are estimated from Project construction activities. Average annual GHG emissions from Project construction activities are estimated to be well below BAAQMD’s 2010 land-use emissions threshold. Therefore, the Proposed Project would not make a considerable contribution to this cumulative impact.

Cumulative Impact NO-1: Exposure of Noise-sensitive Land Uses to Temporary Increases in Noise and Vibrations – Less than Significant

Noise and vibrations generated from past, present, and reasonably foreseeable future growth in the City of Sunnyvale are considered a significant cumulative impact. Project construction would require the use of heavy equipment that would temporarily increase noise and vibration levels at properties near the Project Work Area. While construction noise in any given location would be short term, noise-sensitive land uses are located nearby the Sunnyvale Channels. Noise-sensitive land uses include residences, schools, hospitals, and hotels, among others.

As discussed in Chapter 3.10, “Noise,” noise generated during Project construction near noise-sensitive land uses is estimated to occur below the Federal Transit Administration noise threshold of 90 A-weighted decibels (dBA). Vibrations from construction activities are estimated to occur below the building damage threshold of 0.3 inches per second peak particle velocity (in/sec PPV). Vibrations from construction activities could exceed annoyance thresholds within 75 feet of the Project Work Area, particularly for residential homes along on the East Channel. As shown in the list of cumulative projects in Table 4-2, the curb ramp resurfacing projects of SR 82 are the only other projects with the potential to generate vibrations at noise-sensitive land uses within 75 feet of the East Channel Project Work Area. These projects would expose noise-sensitive land uses to vibrations for a very short-period of time, and it is unlikely these projects and the Proposed Project would be constructed at the same place and at the same time. As a result, it is unlikely noise-sensitive receptors would be exposed to a combination of vibrations from the Proposed Project and other projects on SR 82.

The Project would expose noise-sensitive land uses to short-term construction noise and vibrations, but typically at levels below applicable noise and vibration thresholds. With implementation of BMPs NO-1 and NO-2 (see Table 8-2 in Chapter 2 and Chapter 3.10 “Noise”), the District would minimize noise generation during Project construction activities. No long-term noise or vibrations would result from the Project; noise and vibrations impacts would cease upon completion of the Project. For these reasons, the contribution of the Proposed Project to this cumulative impact would not be considerable.

Cumulative Impact HM-1: Impacts on Existing Hazards – Less than Significant with Mitigation

As described in Chapter 3.7, “Hazards and Hazardous Materials,” existing and past soil and groundwater contamination are present in the area surrounding the Sunnyvale Channels. To date, no existing hazardous materials contamination has been identified directly within the Project Work Area. However, volatile organic compound (VOC) spills adjacent to the West Channel is known to have contributed to contaminated shallow groundwater in this area. The City’s landfill is also known to have generated VOC-contaminated groundwater (SCVWD 2013). The majority of known hazardous spill sites are undergoing various stages of remediation and the landfill is closely monitored by regulatory agencies. However, public health and safety continue to be threatened by hazardous materials in the project area.

Owing to the presence of historic and existing hazardous materials sites in the Project vicinity, it is considered possible that contaminated soil and groundwater from this and other known sites could occur within the Project Work Area. Additionally, other undiscovered sites of contaminated soil and groundwater could exist in the Project Work Area, including in levee/maintenance roads, channel bed and banks, and in groundwater. Project excavation activities could potentially disturb previously undiscovered contaminated soil and groundwater. With implementation of MM HM-1, the District would conduct Phase I and Phase II Environmental Site Assessments to identify areas of contamination where construction excavation would occur and, if necessary, implement site remediation actions and measures to ensure the safety of the public and environment.

The Proposed Project would utilize hazardous materials, such as oils, fuels, or other petroleum products for construction activities. As regulated by federal, state, and local agencies, projects involving ground disturbance are required to implement worker, public safety, and environmental protection measures to avoid and minimize the potential for release and exposure to hazardous materials.

In consideration of other planned construction activities in the project area, and presence of contaminated soil and groundwater, a potentially significant cumulative impact on people and the environment could occur from exposure to hazardous materials.

Through standard BMPs, mitigation measures contained in other project CEQA documents, and regulatory agency permit conditions, projects in the region will mitigate their contributions to hazards and hazardous material impacts, reducing cumulative impacts. The Proposed Project would implement a number of BMPs and MM HM-1 to reduce impacts on hazards and hazardous materials, as described in Chapter 3.7. Implementation of the Project’s mitigation measures would ensure that the Project’s

contributions to cumulative impacts on hazards and hazardous materials would not be considerable.

Cumulative Impact REC-1: Impacts on Recreation – Less than Significant

As discussed in Chapter 3.11, “Recreation,” approximately 3.5 miles of the publically accessible San Francisco Bay Trail are located within the City of Sunnyvale and in the Project Area. Unauthorized recreational use of the District’s maintenance roads along the Sunnyvale Channels also currently occurs. There are many existing and planned recreational facilities in the project area, as listed in Table 4-2. Planned closures of other recreational facilities in the project area are not known at this time. However, planned development in the Project Area is anticipated to increase demands on recreational facilities over time in a manner that could result in a significant cumulative impact on recreation.

Proposed Project construction would be phased to ensure that some access points and stretches of the Bay Trail would remain open while other stretches are temporarily closed. Since these closures would be temporary, and because recreational use of the District’s maintenance roads is not authorized for public access, temporary closures of the maintenance roads and the Bay Trail for Project construction would not make a considerable contribution to significant cumulative impacts on recreation, when considered with other recreational facilities in the project area and region.

If a Joint Use Agreement (JUA) is established between the District and the City of Sunnyvale, the District would pave several stretches of its existing gravel maintenance roads to provide authorized public access once construction is complete. The following reaches would be paved: along the East Channel from the John W. Christian Greenbelt to Tasman Drive and from Moffett Park Drive to Caribbean Drive, and along the West Channel from N. Mathilda Avenue to Caribbean Drive. Paved maintenance roads would comply with specifications for Class I Bike Facilities prescribed the City of Sunnyvale 2006 Bicycle Plan (City of Sunnyvale 2006) and further support the City’s commitment to encourage bicycling and provide access to open space and recreation facilities. The scope of recreational activities on the newly paved maintenance road reaches are anticipated to reflect the level and type of activities that currently occur under existing conditions, including biking, jogging, and walking. No motorized vehicles would be allowed on the paved reaches. If implemented, this impact would benefit recreational communities in the City and region. However, because it is not certain whether a JUA will be established, the conclusion related to cumulative recreation impacts remains that the Proposed Project would not make a considerable contribution, as described in the previous paragraph.

Cumulative Impact TR-1: Disruption of Traffic Patterns – Less than Significant with Mitigation

Automobile traffic generation in the City of Sunnyvale from past, present, and reasonably foreseeable future growth in the City and surrounding areas is considered a significant cumulative impact. Project construction would generate trips on several roadways within the Project Area, primarily in Sunnyvale, from materials hauling and worker commute trips. Construction trip generation is presented in Tables 3.12-4 and 3.12-5, in Chapter 3.12, "Traffic and Transportation." Additionally, Project construction itself would result in temporary lane closures, as presented in Table 3.12-6, in Chapter 12, "Traffic and Transportation."

The generation of construction-related traffic is not expected to significantly degrade the operation of freeways, expressways, or major arterials or collectors. The addition of heavy trucks and other construction traffic could temporarily disrupt traffic flow on nearby residential streets. Lane closures associated with construction would temporarily result in a small increase in travel time along Caribbean Drive, between Crossman Avenue and Moffett Park Drive, although an insubstantial impact on the Level of Service (LOS) of these intersections would result. Lane closures also may impair roadway capacity and increase travel time on the street segments adjacent to the crossings for a few hours. Although the District will implement the BMP TR-1 to increase public awareness and minimize safety impacts during construction, the BMP would not effectively reduce the temporary potential impacts on traffic operation. As a result, the Proposed Project has potential to make a considerable contribution to this significant cumulative impact. Implementation of MM TR-1 would minimize the traffic operation impact on residential streets, at roadway crossing during lane closures, and on Caribbean Drive during bridge replacement. With implementation of MM TR-1, the Proposed Project's contribution to this cumulative impact would not be considerable.

Cumulative Impact WQ-1: Impacts on Water Quality – Less than Significant with Mitigation

South San Francisco Bay is CWA Section 303(d) listed as impaired by chlordane, dichlorodiphenyltrichloroethane (DDT), dieldrin, dioxin compounds, furan compounds, invasive species, mercury, polychlorinated biphenyls (PCBs), and selenium from multiple known and unknown sources. The majority of these pollutants are adhered or bonded to soil particles that are transported through the stream network and deposited in the Bay, where pollutants accumulate. Any contribution of CWA Section 303(d) listed pollutants to South San Francisco Bay constitutes a significant cumulative impact. The state has established Total Maximum Daily Loads (TMDLs), or pollution control plans, for mercury, PCBs, and dioxin in the San Francisco Bay. Noncompliance with these TMDLs is considered a significant cumulative impact.

Ground-disturbing activities associated with Project construction would expose and loosen soils, leaving the channel and levee areas susceptible to erosion and subsequent

transport of sediment downstream to the Guadalupe Slough and South San Francisco Bay. Previously undiscovered contaminated soil and groundwater may also be present in the Project Area. Exposure and accidental release of contaminated soil and groundwater could potentially occur during Project construction excavation and grading activities, and contaminated soil and groundwater could transport to and further impair water quality in South San Francisco Bay. This is considered a significant cumulative impact.

For Project construction, the District is required to comply with the CWA Section 402 National Pollution Discharge Eliminated System (NPDES) Construction General Permit. This permit is overseen by the State Water Resources Control Board and requires development and implementation of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP identifies BMPs to prevent soil erosion, restrict discharges of soil and water to surface water bodies, and other measures to protect water quality to the maximum extent possible. Compliance with the state's Construction General Permit is required for all ground-disturbing projects over 1-acre. Additionally, the District implements standard BMPs for all their projects to protect water quality and the environment during construction activities (see Chapter 3.8, "Hydrology, Geomorphology, and Water Quality" for the list of applicable District BMPs).

Potential impacts of accidental release of hazardous materials from construction equipment and excavations into potentially contaminated soil and groundwater are addressed in Chapter 3.7, "Hazards and Hazardous Materials" and discussed in Cumulative Impact HM-1. As discussed in Chapter 3.7 and Chapter 3.8, implementation of MM HM-1 would require detailed evaluation of existing contaminated soil and groundwater in the project area, and implement measures to ensure contaminated soil and groundwater are not released into the environment during Project construction. Implementation of the avoidance and minimization measures implemented according to MM HM-1 would adequately prevent against release or transport of potentially contaminated sediment from Project construction activities downstream to Guadalupe Slough and South San Francisco Bay.

After construction, the Proposed Project would not directly contribute to pollutants impairing the South San Francisco Bay. Existing water quality conditions in the water conveyed through the project area would not change as a result of the Proposed Project. Project operation would not affect implementation of established TMDLs for San Francisco Bay. TMDLs are implemented at the regional level, primarily through municipal NPDES Stormwater permits and waste discharge requirements issued to city and county municipalities.

The Proposed Project would implement a number of BMPs and MM HM-1 to reduce impacts on water quality, as described above. Collectively, implementation of the Project's avoidance, minimization, and mitigation measures would ensure that the Project's contributions to cumulative impacts on water quality would not be considerable.

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Chapter 5

Alternatives

5.1 Introduction

The purpose of the alternatives analysis in an EIR is to describe a range of reasonable alternatives to the project that can feasibly attain most of the identified project objectives, but reduce or avoid one or more of the project's significant impacts. This chapter describes the alternatives to the Proposed Project that were considered and evaluated for their potential environmental impacts.

Regulatory requirements for consideration of alternatives are presented below. The chapter then continues with a description of the alternatives development process, alternatives that were considered, and alternatives that were considered but dismissed from detailed analysis. The chapter concludes with identification of the environmentally superior alternative.

5.2 Regulatory Setting

CEQA requires that an EIR evaluate a reasonable range of alternatives to the proposed action, including an alternative where no project would be developed. Although no clear rule exists for determining a reasonable range, CEQA provides guidance that can be used to define the range of alternatives for consideration in the environmental document. First, the range of alternatives under CEQA is governed by the rule of reason, which requires the EIR to examine only alternatives that feasibly attain most of the project objectives and would avoid or substantially lessan any of the significant effects of the project. The range of feasible alternatives shall be selected and presented in a manner to foster public participation and informed decision making (State CEQA Guidelines Section 15126.6[f]). In determining whether alternatives are feasible, lead agencies are guided by the general definition of feasibility found in State CEQA Guidelines Section 15364: "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors." In accordance with State CEQA Guidelines Section 15126.6[f][1], the lead agency must consider site suitability, economic viability, availability of infrastructure, general plan consistency, other regulatory limitations, jurisdictional boundaries, and the proponent's control over alternative sites in determining the range of alternatives to be evaluated in an EIR. An EIR must briefly describe the rationale for selection and rejection of alternatives and the information that the lead agency relied on in making the selection. It should also identify any alternatives that were considered by the lead agency but were rejected as infeasible during the scoping process and briefly

explain the reason for their exclusion (State CEQA Guidelines Section 15126[d][2]). These guidelines were used in developing the alternatives and their evaluation, as described below.

A No Project Alternative also must be considered. The No Project alternative allows decision makers to compare the impacts of approving the action against the impacts of not approving the action.

5.3 Alternatives Development Process

Alternatives to the Proposed Project were developed to avoid or reduce potential environmental effects, while also attempting to address Project objectives. Some alternatives were developed that would change certain Project components and activities, while still implementing other portions of the Proposed Project. Other alternatives involved changing the timing and duration for implementation of the Proposed Project.

All alternatives considered would provide riverine 100-year flood protection for the Sunnyvale Channels. Alternatives would seek to achieve goals similar to the Proposed Project, although the alternatives may reach these goals to a greater or lesser extent than the Proposed Project. A reasonable range of alternatives is presented in Section 5.4, "Alternatives Considered," describing their potential impacts as well as benefits.

During the Project's early planning phase, the District initially developed several conceptual project alternatives to fulfill the four identified outcomes of the District's Clean, Safe Creeks and Natural Flood Protection (CSC) Plan and the Project's specific objectives (discussed below in this section). (For a discussion of the CSC Plan, refer to Chapter 1, "Introduction.") Each conceptual project alternative consisted of a combination of infrastructure upgrades to improve flood protection and repair existing in-channel erosion sites. Conceptual alternatives were evaluated and refined based on the District's Natural Flood Protection (NFP) evaluation process and a risk assessment (discussed in Chapter 2, "Project Description"). The alternatives considered by the District throughout the Project's planning phase were also used as a basis to develop the range of reasonable alternatives required by CEQA. Additional alternatives were developed for this CEQA alternatives analysis and are described in the reasonable range of alternatives below.

Project Goals and Objectives

The Proposed Project was developed to meet the following objectives:

- Provide riverine flood protection where historic flooding has occurred and future flooding is possible from a 100-year storm event (1% risk of occurring any year);
- Provide a basis to update Federal Emergency Management Agency (FEMA) flood hazard maps upon completion of the Proposed Project to reflect riverine 100-year flood protection along the improved channels and alleviate requirements for flood insurance in the communities surrounding the Sunnyvale Channels;
- Provide infrastructure improvements beyond 100-year flood protection as necessary to meet the District's freeboard standards;
- Provide water quality improvements by repairing/stabilizing existing erosion sites; and
- Provide recommendations for recreational enhancements in coordination with flood and water quality improvements.

In addition, construction of the Proposed Project is targeted for completion by December 31, 2015, before the completion of the November 2000 voter-approved Clean, Safe Creeks Plan (CSC Plan). The targeted completion date for the CSC Plan is December 31, 2016.

Significant Environmental Impacts of the Proposed Project that can be Mitigated

The following impacts have been identified as potentially significant, but they would be mitigated to a less-than-significant level by implementation of mitigation measures:

- **Impact AES-1:** Temporary Visual Impacts Resulting from Construction Activities
- **Impact BIO-1:** Loss or Temporary Disturbance of Wetlands and Other Waters
- **Impact BIO-2:** Impacts on Green Sturgeon, Steelhead, and Longfin Smelt
- **Impact BIO-5:** Impacts on Western Pond Turtles
- **Impact BIO-7:** Impacts on the White-tailed Kite, Loggerhead Shrike, and Bryant's Savannah Sparrow
- **Impact BIO-8:** Impacts on Burrowing Owls
- **Impact BIO-9:** Impacts on the Alameda Song Sparrow and San Francisco Common Yellowthroat
- **Impact BIO-10:** Impacts on Non-Special-Status Birds

- **Impact BIO-11:** Impacts on Salt Marsh Harvest Mouse and Salt Marsh Wandering Shrew
- **Impact BIO-12:** Impacts on Bats
- **Impact HM-1:** Potential Release of Existing Contaminated Soil and Groundwater Discovered during Project Construction Activities and Resulting Exposure to Construction Workers, the Public, or the Environment
- **Impact HM-3:** Emission or Handling of Hazardous Materials in Proximity to Schools
- **Impact HYD/WQ-3:** Water Quality Impacts due to Discharge of Contaminated Soil or Groundwater
- **Impact TR-1:** Temporary Construction Traffic Generation in Exceedance of Roadway LOS Standards or Substantial Increase in Traffic
- **Impact TR-2:** Temporary Substantial Increase in Safety Hazards
- **Impact TR-3:** Temporary Increases in Emergency Response Times
- **Impact TR-5:** Temporary Conflicts with Alternative Transportation
- **Impact UTL-1:** Temporary Disruptions to Water, Wastewater, Stormwater, Power Systems and Other Utility Systems during Project Construction Activities
- **Cumulative Impact AIR-1:** Temporary Cumulative Increase in NO_x, ROG, and Exhaust and Particulate Matter PM₁₀ and PM_{2.5} from Construction Activities
- **Cumulative Impact BIO-1:** Cumulative Impact on Biological Resources
- **Cumulative Impact HM-1:** Impacts on Existing Hazards
- **Cumulative Impact TR-1:** Disruption of Traffic Patterns
- **Cumulative Impact WQ-1:** Impacts on Water Quality

Significant and Unavoidable Environmental Impacts of the Proposed Project

The following impacts have been identified as significant and unavoidable:

- **Impact AIR-3:** Result in a Cumulatively Considerable Net Increase of any Criteria Pollutant for Which the Project Region is Non-Attainment
- **Impact NO-2:** Temporary Groundborne Vibration Resulting in Building Damage or Annoyance in the Project Area
- **Cumulative Impact AIR-1:** Temporary Cumulative Increase in NO_x, ROG, and Exhaust and Particulate Matter PM₁₀ and PM_{2.5} from Construction Activities

5.4 Alternatives Considered

The following alternatives were developed and evaluated because they would meet most of the Proposed Project objectives, would be feasible, and would avoid or substantially reduce one or more significant impacts of the Proposed Project:

- No Project Alternative
- Pond A4 Detention Basin Alternative
- Flood Protection Improvements Only Alternative
- Increased Construction Phasing Alternative

Table 5-1 provides a comparison of alternatives to the Proposed Project, focusing on key differences in project components, and adverse and beneficial impacts between the Proposed Project and the considered alternatives.

Table 5-1. Comparison of EIR Alternatives

Project Alternative	Notable Comparisons to Proposed Project		
	Comparison to the Proposed Project	Adverse Effects Compared to the Proposed Project	Reduced Adverse Effects Compared to the Proposed Project
No Project Alternative	<ul style="list-style-type: none"> ▪ No development of any Proposed Project components ▪ No construction activities would occur and the Project Area would remain in its current condition ▪ Current stream channel maintenance activities would continue; the frequency of these activities may increase in the future 	<ul style="list-style-type: none"> ▪ No improved flood protection ▪ No improved water quality conditions 	<ul style="list-style-type: none"> ▪ Avoids all impacts associated with construction activities ▪ Avoids temporary impacts on biological resources
Pond A4 Detention Basin Alternative	<ul style="list-style-type: none"> ▪ Both Sunnyvale Channels would be rerouted to discharge into Pond A4 ▪ The design water surface elevation would be reduced ▪ The vertical height of floodwalls, levees and headwalls would be reduced 	<ul style="list-style-type: none"> ▪ Potential degradation of water quality in Guadalupe Slough ▪ Increased impacts on biological impacts 	<ul style="list-style-type: none"> ▪ Same flood protection would be provided as under the Proposed Project ▪ Potential improvement in water quality within Pond A4
Flood Protection Only Alternative	<ul style="list-style-type: none"> ▪ Development of flood protection improvements only ▪ No in-channel repairs or maintenance road repairs ▪ Current stream channel maintenance activities would continue; the frequency of these activities may increase in the future 	<ul style="list-style-type: none"> ▪ No improved water quality conditions; erosion and sedimentation conditions would continue to threaten water quality and biological resources 	<ul style="list-style-type: none"> ▪ Avoids several impacts associated with construction activities ▪ Avoids channel dewatering impacts related to biological resources and water quality
Increased Construction Phasing Alternative	<ul style="list-style-type: none"> ▪ Construction of the same features as under the Proposed Project ▪ Extended duration of construction to 4 years 	<ul style="list-style-type: none"> ▪ Extended construction-related transportation/traffic impacts 	<ul style="list-style-type: none"> ▪ Avoids significant air quality emission impacts associated with construction activities

No Project Alternative

Alternative Description

In the No Project Alternative, none of the components of the Proposed Project would be constructed, including no flood protection improvements, erosion repairs, sediment removal, or any other components. No construction activities would occur, and the Project Area would remain in its current condition.

Riverine flood flows from storm events larger than the approximately 10-year event would continue to overtop channel banks and inundate surrounding areas, including several residential and business properties. In addition, FEMA flood maps would not be updated and no adjustments to flood insurance rates would occur.

Under the No Project Alternative, current stream maintenance activities, such as sediment removal, erosion repair, and vegetation maintenance, would continue under the District's SMP. However, the frequency of these activities may increase under this alternative compared to the Proposed Project. For example, because existing erosion sites would not be repaired under this alternative, it is reasonable to expect that some of these sites would instead undergo on-going repair and potentially increased maintenance in the future under the SMP.

Impact Analysis

Numerous beneficial effects associated with the Proposed Project would not occur under the No Project Alternative. This alternative would not provide flood protection for areas surrounding the Sunnyvale Channels, including riverine flooding of the Sunnyvale Channels associated with a 100-year storm event, a 10-year high tide, and 2 feet of future sea level rise. Repair of eroding channel banks would not occur, thus long-term water quality benefits resulting from reduced sediment loading after bank repairs under the Proposed Project would not be realized.

The No Project Alternative would avoid impacts associated with construction of the Proposed Project, including those related to temporary groundborne vibrations in proximity to sensitive residences; temporary impacts on aesthetics; temporary impacts on biological resources; potential exposure and release of contaminated soil and groundwater; temporary impacts on water quality; potential temporary disruption to utility services; and temporary effects to traffic and transportation services.

Pond A4 Detention Basin Alternative

Alternative Description

The Pond A4 Detention Basin Alternative would reroute both Sunnyvale Channels to discharge into Pond A4 instead of the Guadalupe Slough. Pond A4 would be used as a flood detention basin for temporary storage of flood flows. Flows between Pond A4 and Guadalupe slough are currently regulated through a single slide gate and five tide gates.

Under this alternative, the slide gate would remain open under normal condition, but would be closed during storm events, allowing Pond A4 to function as a detention basin for storm flows. The pond would drain via the tide gates during subsequent low tides. Overall, a much larger amount of water would be moved between Pond A4 and Guadalupe Slough under this alternative than currently occurs or would occur under the Proposed Project. In addition, under this alternative, the southern and northeast levees of Pond A4 would be raised by 1–2 feet, to facilitate detention of the increased flows from the Sunnyvale Channels.

The rerouting of the Sunnyvale Channels would 1) remove both channels from tidal influence in the Guadalupe Slough; 2) eliminate backwatering effects from other nearby channels in the larger watershed (i.e., Calabazas and San Tomas Aquino Creeks); and 3) avoid future effects from sea level rise to water levels in the Sunnyvale Channels. As a result, the design water surface elevation for this alternative would be slightly reduced compared with the Proposed Project, particularly in the tidally influenced channel reaches.

This alternative also proposes the following components included in the Proposed Project: floodwalls, levee modifications, and bridge/culvert modifications for flood protection improvements; rock slope protection and wingwall and outfall bank stabilization for erosion repairs; and all other Project components. The location of these components would not differ from the Proposed Project. However, the vertical height of floodwalls, levees, and headwalls would be lower owing to the detention basin role of Pond A4 and reduced design water-surface elevation expected under this alternative. Under this alternative, additional truck trips would be required to transport imported soil fill to raise the levees around Pond A4.

Impact Analysis

Both this alternative and the Proposed Project would provide the same level of flood protection to the surrounding areas. 100-year flood flows would be contained within the Sunnyvale Channels and Pond A4.

No change, or a negligible change, in the intensity and duration of construction activities along the Sunnyvale Channels is expected under this alternative compared with the Proposed Project. However, increased construction activities at Pond A4 and Guadalupe Slough would occur. As a result, temporary construction-related impacts would affect a larger project area compared to those evaluated for the Proposed Project.

As discussed in Chapter 3.8, “Hydrology, Geomorphology and Water Quality,” the District has conducted studies of the water quality of Pond A4 and surrounding channels, including those associated with the Guadalupe Slough. Water quality is identified as impaired both in Pond A4, Guadalupe Slough, and soil within levees surrounding Pond A4 and Guadalupe Slough. Methylmercury levels Pond A4 sediment are above the average levels of San Francisco Bay sediment concentrations. Under the Pond A4 Detention Basin Alternative, the increased movement of water from Pond A4 to the

Guadalupe Slough, due to increased flow discharges from the Sunnyvale Channels, may further impair water quality of Guadalupe Slough. However, this alternative may beneficially reduce methylmercury conditions in Pond A4 due to increased circulation between the pond and Guadalupe Slough, and discharges from the Sunnyvale Channels. Increased circulation and flushing within Pond A4 would improve water quality conditions and reduce conditions which cause methylmercury formation.

Increased impacts on biological resources may result due to construction activities within sensitive habitats, and altered flow conditions at Pond A4 and Guadalupe Slough.

Flood Protection Only Alternative

Alternative Description

The Flood Protection Only Alternative would construct only the components of the Proposed Project that provide flood protection, namely floodwalls, levee enlargements, and bridge and culvert modifications. Channel improvements, including erosion repairs, concrete channel lining, and wingwall and outfall bank stabilizations, and maintenance road improvements would not be developed under this alternative.

Under this alternative, the intensity or duration of construction would be less than the Proposed Project because no channel or maintenance road repairs would occur. Construction of this alternative would require the same 2-year period as the Proposed Project, but each day less construction activities would occur and fewer workers would be required. Alternatively, construction could be completed in 1 year and use the same number of workers as the Proposed Project.

In the Flood Protection Only Alternative, current stream maintenance activities, such as sediment removal, erosion repair, and vegetation maintenance, would continue. However, the frequency of these activities may increase in the future since existing channel erosion sites would not be repaired.

Impact Analysis

The Flood Protection Alternative would result in riverine flood protection to the same extent as the Proposed Project.

Repair of eroding channel banks would not occur, thus long-term water quality benefits resulting from reduced sediment loading after bank repairs under the Proposed Project would not be realized.

Under this alternative, impacts on biological resources would be less than under the Proposed Project due to less work in sensitive channel habitats. Wetlands habitat impacts would be reduced because channel banks would not be hardened with rock or concrete. Channel dewatering would not be as extensive as under the Proposed Project. Therefore, fewer impacts on aquatic species would result under this alternative.

As a result of the reduced intensity and duration of construction under this alternative, certain construction-related impacts would be less than with the Proposed Project. Temporary impacts on traffic and transportation and air quality emissions would be reduced because fewer worker commute and materials hauling trips would be required. Channel dewatering activities would be limited to work at a few channel roadway crossings for bridge/culvert modifications. As a result, the potential for temporary impacts on water quality from encountering existing contaminated shallow groundwater would be reduced compared with the Proposed Project. Finally, the temporary generation of groundborne vibrations within proximity to sensitive residential users would be reduced.

Increased Construction Phasing Alternative

Alternative Description

The Increased Construction Phasing Alternative would construct the same components as the Proposed Project, but the components would be constructed over 4 years instead of two years as would occur under the Proposed Project. The extended construction period would reduce the concentration of construction activities occurring each day.

Impact Analysis

Compared to the Proposed Project, the extended construction period under this alternative would reduce the concentration of construction activities occurring each day and thus reduce average daily emissions of air quality contaminants, particularly NOx, below BAAQMD thresholds (see Table 5-2.)

Table 5-2. Estimated Average Daily Emissions from Project Construction Activities for the Increased Construction Phasing Alternative

Emissions Source	Average Daily Emissions (average pounds per day)						
	ROG	CO	NOx	Exhaust		Fugitive Dust	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Construction Crews (Alternative Scenario: 44-month, 520 day construction duration)	4.6	22.4	46.4	2.7	2.4	20.0	4.2
Threshold of Significance	54	None	54	82	54	BMPs	BMPs

Under this alternative, traffic patterns would be disrupted more frequently due to the longer construction period. Other temporary construction impacts, such as those related to aesthetics, groundborne vibrations, and potential exposure and release of contaminated soil and groundwater, would be the same significance level as the Proposed Project but would occur on a different construction timeline. The Increased Construction Phasing Alternative would meet all Proposed Project objectives. However, the CSC Plan goal for project completion by December 2016 would not be met and it

would take an extra two years for flood protection benefits to be realized. Overall, the Increased Construction Phasing Alternative would result in reduced significant impacts compared to the Proposed Project.

5.5 Alternatives Considered and Dismissed

The following alternatives were considered but dismissed from further analysis for one or more of the following reasons: (1) they were not substantively different from one of the considered alternatives, (2) they would not sufficiently meet the Proposed Project objectives, (3) they were determined to be infeasible, or (4) they would not avoid or substantially reduce one or more significant impacts of the Proposed Project:

- Earthen Channel Restoration/Bench Construction Alternative
- Box Culverted Channel Alternative
- Concrete-Lined Channel Alternative
- Off-Site/Braly Park Detention Basin Alternative
- Levee Enlargement Alternative

Each of these alternatives is described further below, along with the specific reasons for dismissal.

Earthen Channel Restoration/Bench Construction Alternative

The Earthen Channel Restoration/Bench Construction Alternative would only use rock and concrete slope protection as in-kind replacement of existing and failing hardscape channel slope protection. No rock or concrete would be used to protect currently earthen-banked channel areas. Instead, earthen channel restoration would be used in-kind on existing earthen-banked channel areas that are failing, by constructing a bench into one or both channel banks and lessening the overall bank slope. Construction of benches would also require maintenance roads/levees to be set back from their current position in some locations. All other components in the Proposed Project would be the same. However, at locations where benches are constructed, the channel's capacity would be increased, which would likely result in floodwalls being reduced in size/height or eliminated altogether at some locations.

This alternative was dismissed from consideration because the Project easements, located between the channels and existing adjacent urban development, do not provide adequate floodplain width or right-of-way to construct benches and set back the existing maintenance roads/levees. As such, this alternative is considered infeasible.

Box Culverted Channel Alternative

The Box Culverted Channel Alternative proposes an entirely different approach to flood protection than the Proposed Project. No flood protection improvements—floodwalls, levees modification, and bridge/culvert modifications—would be developed under this alternative. Instead, existing open channel reaches in areas with insufficient riverine 100-year flood capacity or freeboard would be replaced with an enclosed and buried concrete box culvert designed to contain the 100-year flood flow. Replacing the existing open channel reaches with buried box culverts would also repair and stabilize numerous existing erosion sites. The ground surface above buried channel reaches would be restored for other uses, although the District would need to maintain access for maintenance of the box culverts.

This alternative was dismissed based on a combination of factors. The cost of the Box Culverted Channel Alternative is substantially greater than the Proposed Project (SCVWD 2010), an important factor since the Project is funded through the CSC Plan. This alternative would require maintenance of several long reaches of buried box culvert, such as for sediment and debris removal. While this maintenance is achievable, it would present significant safety issues owing to the limited capacity for workers and equipment. Finally, by eliminating open water channels, this alternative would present a substantial impact on biological resources. Potential biological impacts associated with replacing open channels with culverts would be especially critical in the downstream reaches where most of the buried culverts would be located. The downstream areas provide the highest habitat value in the Sunnyvale Channels because of the tidal influence and marginal marshland habitat. This alternative would not avoid or substantially lessen any of the significant effects of the Project. CEQA only requires a range of reasonable alternatives which would feasibly attain most of the project objectives but would avoid or substantially lessen any of the significant effects of the project. For these reasons, the District considers this alternative infeasible.

Concrete-Lined Channel Alternative

The Concrete-Lined Channel Alternative proposes to line the existing channels with concrete instead of using the rock slope protection technique. Under this alternative, the Sunnyvale Channels would be lined with concrete at all locations where rock slope protection would be used in the Proposed Project (a significant length of the channels).

With this alternative, the velocity of flows in the Sunnyvale Channels are generally expected to be accelerated, as a result of the reduced surface area and reduced time of concentration provided by the concrete channel lining. As a result, flood flows and the design water-surface elevation would be slightly reduced compared with the Proposed Project. This alternative would also include all of the flood protection improvements considered in the Proposed Project—floodwalls and levee and bridge/culvert modifications. However, the vertical height of floodwalls, levees, and headwalls would be slightly reduced owing to the slightly reduced design water-surface elevation expected

under this alternative. Accelerated flows could also possibly result in increased scour and erosion downstream of concrete-lined channel reaches. The lining of channels with concrete would also reduce the habitat value of the channels, compared with the use of rock in the Proposed Project. Additionally, the extent and duration of construction activities is expected to be similar to or slightly greater than under the Proposed Project.

This alternative was dismissed because concrete lining would result in increased adverse environmental impacts compared to the use of rock slope protection in the Proposed Project. The floodwall, headwall, and levee components (being slightly reduced) are not substantially different from those components as they were considered in the Pond A4 Detention Basin Alternative discussed above.

Off-Site/Braly Park Detention Basin Alternative

The Off-Site/Braly Park Detention Basin Alternative proposes to provide flood protection by diverting high flows during a flood event into a belowground detention area and temporarily storing the flows until the flooding period is over. In considering this alternative, areas along the Sunnyvale Channels were evaluated for their suitability to serve as a detention basin (besides Pond A4, which is considered in the Pond A4 Detention Basin Alternative discussed above). Suitable site locations would need to have the following attributes: be relatively close to the Sunnyvale Channels; be far enough downstream that a sufficient amount of flood flows could be diverted and stored during flood events; and contain enough space and volume to accommodate a detention basin facility.

Braly Park, located immediately to the northeast of the Iris Avenue crossing of the East Channel, was the only site identified as suitable for an off-site detention basin. Braly Park is owned by the City of Sunnyvale (City) and located contiguous to Braly Elementary School, which is operated by the Santa Clara Unified School District (SCUSD). A detention basin at this location would need to be 4 acres and extend to a depth of approximately 8 feet. In this scenario, the existing tennis courts and playground structures at Braly Park would be rebuilt at the new field. This alternative would also require all the other downstream components included in the Proposed Project including floodwalls, bridge replacements, levee altering, etc. However, the vertical height of floodwalls would likely be slightly reduced owing to the detention of stored runoff and accompanying reduction of flood flows in the channels.

This alternative was dismissed based on a combination of factors. The District discussed this alternative with the City and SCUSD. Approval from both agencies was required for the alternative to move forward and both agencies did not support the use of Braly Park as a detention basin (SCVWD 2010). In addition, the basin would require frequent maintenance of the inlet and outlet, such as clearing of silt and other flood debris from the facility. The overall maintenance needs of this alternative would be much greater than for the Proposed Project. The potential water quality of flows discharged from the detention facility would also require further study. Finally, the cost of this alternative

would be substantially greater than the Proposed Project as a consequence of the construction of the facility and the increase in maintenance needs. Cost is an important factor since the Project is funded through the CSC Plan. For the combination of reasons discussed, the District considers this alternative infeasible.

Levee Enlargement Alternative

The Levee Enlargement Alternative would have the same components as the Proposed Project, with the exception of floodwalls, which would be replaced with levees. This alternative would be implemented by: 1) use of levees instead of floodwalls at the same locations as under the Proposed Project, or 2) use of levees instead of floodwalls at all locations downstream of Caribbean Drive on both channels. Levee heights would be the same as the height of floodwalls under the Proposed Project.

Levee construction would require more imported soil compared to the amount required for floodwall construction. However, less soil would be exported under this alternative. Overall, a similar number of truck trips would occur under this alternative and the Proposed Project. The duration of construction activities would be the same under this alternative and the Proposed Project.

The Levee Enlargement Alternative would generally result in similar construction-related impacts as the Proposed Project. Impacts on traffic, air quality and greenhouse gas emissions, biological resources, etc. would be generally as described for the Proposed Project. Impacts due to groundborne vibrations would also likely be similar to the Proposed Project because vibratory rollers would be used to compact the heightened levee surfaces. Less excavation would occur compared to the Proposed Project. Therefore, this alternative would result in reduced potential for exposure or release of potentially hazardous contaminated soil and groundwater compared with the Proposed Project. However, since none of the significant impacts identified under the Proposed Project would be reduced, this alternative was dismissed from consideration.

5.6 Environmentally Superior Alternative

Based on this evaluation the No Project Alternative is considered the environmentally superior alternative, because it would avoid all of the adverse impacts of the Proposed Project and would not result in construction or operational environmental impacts.

When the No Project alternative is the environmentally superior alternative, CEQA requires that an environmentally superior alternative be selected from among the other alternatives to the Proposed Project (CEQA Guidelines Section 15126.6(e)(2)). These other alternatives can be referred to as “action alternatives” compared to the No Project Alternative. CEQA does not provide a definition for the environmentally superior alternative; however, the environmentally superior alternative is defined as that alternative with the least adverse environmental impacts on the project area and its

surrounding environment. The identification of the environmentally superior alternative considers the relative degree of significant impacts, as well as the relative degree of potential environmental benefit associated with each alternative as compared with the Proposed Project.

The Pond A4 Detention Basin Alternative would meet all the project objectives, but would result in increased water quality and biological resource impacts in sensitive tidal habitats compared with the Proposed Project. Significant impacts on air quality and groundborne vibrations would not be reduced under this alternative.

The Flood Protection Only Alternative would reduce potential temporary impacts on water quality and biological resources due to no ground disturbing activities being conducted in the channel. However, long-term water quality and biological resource impacts would potentially increase due to continued erosion and sedimentation from the lack of channel bank maintenance. Significant impacts on air quality and groundborne vibration would not be reduced under this alternative.

The Increased Construction Phasing Alternative would meet all the primary Proposed Project goals and would result in reduced construction-related air quality emissions compared to the Proposed Project. The Increased Construction Phasing Alternative is considered the environmentally superior alternative, compared to the other alternatives to the Proposed Project.

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Chapter 6.0

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Chapter 7

References

Chapter 1.0 Introduction

Santa Clara Valley Water District (SCVWD). 2013. Clean, Safe Creeks and Natural Flood Protection Plan: Your Vote at Work! Available: <http://www.valleywater.org/Programs/CleanSafeCreeksPlan.aspx>. Accessed: July 10, 2013.

Chapter 2.0 Project Description

Bay Area Air Quality Management District (BAAQMD) 2010. *Bay Air Quality Management District CEQA Guidelines, May 2010*. Available: http://www.baaqmd.gov/~media/Files/Planning%20and%20Research/CEQA/Draft_BAAQMD_CEQA_Guidelines_May_2010_Final.ashx. Accessed January 3, 2013.

SCVWD. See Santa Clara Valley Water District.

Santa Clara Valley Water District (SCVWD). 2008a. *Geotechnical Investigation Report—Sunnyvale East Channel Flood Protection Project—Planning Study*. December.

———. 2008b. *Geotechnical Investigation Report—Sunnyvale West Channel Flood Protection Project—Planning Study*. December.

———. 2010. *Sunnyvale East Channel and Sunnyvale West Channel Flood Protection Project Planning Study Report*. June. Available: http://www.valleywater.org/uploadedFiles/Services/FloodProtection/Projects/SunnyvaleEastandWestChannelsFloodProtectionProject/ReportsandDocuments/Final_PSR_with_Appendices_2010_07_15_lz.pdf?n=1693. Accessed: July 10, 2013.

———. 2012a. Governance Policies of the Board. Ends-Natural Flood Protection (NFP) Policy No. E-3. Revised August 20, 2012.

———. 2012b. *Geotechnical Investigation Report—Sunnyvale East and West Channels Flood Protection Project*. Project No. 2607 4002. Prepared by AMEC Geomatrix, Inc. and Parikh Consultants, Inc.

———. 2012c. Stream Maintenance Program 2012-2022 Update Subsequent Environmental Impact Report. State Clearinghouse Number 2000102055. Final. February. San Jose, California.

Chapter 3.0 Environmental Setting and Impact Analysis

California Department of Conservation Office of Mine Reclamation (OMR). 2012. AB 3098 List. Updated June 29, 2012. Available: http://www.conservation.ca.gov/omr/ab_3098_list/Documents/July2012AB3098.pdf. Accessed: September 21, 2012.

California Department of Fish and Game. 2012. Natural Community Conservation Planning (NCCP). Available: <http://www.dfg.ca.gov/habcon/nccp/>. Accessed September 24, 2012.

California Emergency Management Agency (Cal EMA), California Geological Survey, and University of Southern California. 2009. Tsunami Inundation Map for Emergency Planning Mountain View Quadrangle. Available: http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Inundation_Maps/SantaClara/Documents/Tsunami_Inundation_MountainView_Quad_SantaClara.pdf. Accessed: June 21, 2012.

California Department of Conservation Office of Mine Reclamation (OMR). 2012. AB 3098 List. Updated June 29, 2012. Available: http://www.conservation.ca.gov/omr/ab_3098_list/Documents/July2012AB3098.pdf. Accessed: September 21, 2012.

California Department of Transportation (Caltrans). 2012. Eligible (E) and Officially Designated (OD) Routes. Available: <http://www.dot.ca.gov/hq/LandArch/scenic/cahisys.htm>. Accessed: October 1, 2012.

City of Sunnyvale. 2012. Office of Emergency Services website. Emergency Preparedness. Available: <http://sunnyvale.ca.gov/Departments/PublicSafety/EmergencyPreparedness.aspx>. Accessed September 26, 2012.

OMR. See California Department of Conservation, Office of Mine Reclamation.

Santa Clara County. 1994. *Santa Clara General Plan, Book A: Charting a Course for Santa Clara County's Future: 1995–2010*. Adopted December 20, 1994. Available: http://www.sccgov.org/sites/planning/Plans%20-%20Programs/General%20Plan/Documents/GP_Book_A.pdf. Accessed September 21, 2012.

———. 2012. Santa Clara County Wildland Urban Interface webpage. Available: <http://www.sccgov.org/sites/fmo/Wildland%20Urban%20Interface/Pages/Santa-Clara-County-Wildland-Urban-Interface.aspx>. Accessed: September 25, 2012.

Santa Clara Valley Water District. 2010. Sunnyvale East Channel and Sunnyvale West Channel Flood Protection Project Planning Study Report.

Chapter 3.1 Aesthetics

Association of Bay Area Governments (ABAG). 2013. Bay Trail Plan. Available: http://www.abag.ca.gov/bayarea_info/baytrail/baytrailplan.html. Accessed June 27, 2013.

BLM. See U.S. Bureau of Land Management.

City of Sunnyvale. 2011. *Sunnyvale General Plan*. July. Available: <http://www.sunnyvale.ca.gov/CodesandPolicies/GeneralPlan.aspx>. Accessed: June 10, 2012.

Federal Highway Administration (FHWA). 1988. *Visual Impact Assessment for Highway Projects*. (FHWA-HI-88-054.) USDOT (US Department of Transportation).

FHWA. See Federal Highway Administration.

Jones, G.R., J. Jones, B.A. Gray, B. Parker, J.C. Coe, J.B. Burnham, and N.M. Geitner. 1975. A Method for the Quantification of Aesthetic Values for Environmental Decision Making. *Nuclear Technology* 25(4):682-713.

SCS. See U.S. Soil Conservation Service.

U.S. Bureau of Land Management (BLM). 1980. *Visual Resource Management Program*. Stock No. 024-001-00116-6. Washington, DC: U.S. Government Printing Office.

U.S. Forest Service (USFS). 1995. *Landscape Aesthetics: A Handbook for Scenery Management*. Agriculture Handbook Number 701.

USFS. See U.S. Forest Service.

U.S. Soil Conservation Service (SCS). 1978. *Procedure to Establish Priorities in Landscape Architecture*. Technical Release No. 65. Washington, D.C.

Chapter 3.2 Air Quality

BAAQMD. See Bay Area Air Quality Management District.

Bay Area Air Quality Management District (BAAQMD). 2010a. *Bay Area 2010 Clean Air Plan*. Available: <http://www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans.aspx>. Accessed February 27, 2013.

- . 2010b. *Bay Air Quality Management District CEQA Guidelines, May 2010*. Available: http://www.baaqmd.gov/~media/Files/Planning%20and%20Research/CEQA/Draft_BAAQMD_CEQA_Guidelines_May_2010_Final.ashx. Accessed January 3, 2013.
- . 2010c. Santa Clara Valley. Available: <http://www.baaqmd.gov/Divisions/Communications-and-Outreach/Air-Quality-in-the-Bay-Area/Bay-Area-Climatology/Subregions/Santa-Clara-Valley.aspx>. Last updated October 4, 2010. Accessed January 3, 2013.
- . 2012a. *California Environmental Quality Act Air Quality Guidelines*. Updated May 2012. Available: <http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Updated-CEQA-Guidelines.aspx>. Accessed December 7, 2012.
- . 2012b. Air Quality Standards and Attainment Status. Available: http://hank.baaqmd.gov/pln/air_quality/ambient_air_quality.htm. Accessed January 3, 2013.
- CARB. See California Air Resources Board.
- California Air Resources Board (CARB). 2012. *Ambient Air Quality Standards*. Available: <http://www.arb.ca.gov/research/aaqs/aaqs2.pdf>. Accessed December 7, 2012.
- City of Sunnyvale. 2011. Sunnyvale General Plan. Available: <http://sunnyvale.ca.gov/Departments/CommunityDevelopment/CurrentProjectsandHearings/GeneralPlanConsolidation.aspx>. Accessed January 2, 2013.
- Office of Environmental Health Hazard Assessment (OEHHA). 2012. Technical Support Document for Exposure Assessment and Stochastic Analysis, Final August 2012 pg 11-17.

Chapter 3.3 Biological Resources

- Ainslie, B. J., J. R. Post, and A. J. Paul. 1998. Effects of pulsed and continuous DC electrofishing on juvenile rainbow trout. *North American Journal of Fisheries Management* 18:905-918.
- Albertson, J. D. 1995. Ecology of the California Clapper Rail in South San Francisco Bay. Unpublished Master's Thesis. San Francisco State University. San Francisco, California. 199 p.
- Albion Environmental, Inc. 2009. Santa Clara Valley Water District Burrowing Owl Impact Analysis and Best Management Practices for Eliminating Ground Squirrel Burrows in Levees.

- Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken, editors. 2012. *The Jepson Manual: Vascular Plants of California*, second edition. University of California Press, Berkeley.
- Bias, M. A. 1994. Ecology of the Salt Marsh Harvest Mouse in San Pablo Bay. Unpubl. Ph.D. dissertation. University of California. Berkeley, California.
- Bousman, W. G. 2007a. Breeding Bird Atlas of Santa Clara County, California.
- . 2007b. Snowy Plover *Charadrius alexandrinus*. in: Bousman, W. G. (ed.). Breeding Bird Atlas of Santa Clara County. Santa Clara Valley Audubon Society, Cupertino, California.
- . 2007c. Black skimmer *Rhynchops niger*. in W. G. Bousman, editor. Breeding Bird Atlas of Santa Clara County. Santa Clara Valley Audubon Society, Cupertino, California.
- . 2007d. Long-eared owl *Asio otus*. Pages in W. G. Bousman, editor. Breeding Bird Atlas of Santa Clara County. Santa Clara Valley Audubon Society, Cupertino, California.
- . 2007e. Loggerhead shrike *Lanius ludovicianus*. in W. G. Bousman, editor. Breeding Bird Atlas of Santa Clara County. Santa Clara Valley Audubon Society, Cupertino, California.
- . 2007f. Yellow warbler *Dendroica petechia*. in W. G. Bousman, editor. Breeding Bird Atlas of Santa Clara County. Santa Clara Valley Audubon Society, Cupertino, California.
- . 2007g. Common yellowthroat *Geothlypis trichas*. in W. G. Bousman, editor. Breeding Bird Atlas of Santa Clara County. Santa Clara Valley Audubon Society, Cupertino, California.
- . 2007h. White-tailed Kite *Elanus leucurus*. In: Bousman, W. G. (ed.). Breeding Bird Atlas of Santa Clara County. Santa Clara Valley Audubon Society, Cupertino, California. 547 pp.
- Calflora. 2013. Available: <http://www.calflora.org/index.html>.
- California Burrowing Owl Consortium. 1993. Burrowing Owl Survey Protocol and Mitigation Guidelines.
- California Coastal Conservancy. Unpublished data. 2012 California clapper rail survey data.
- California Department of Fish and Game (CDFG). 2012. Staff Report on Burrowing Owl Mitigation. March 7, 2012.

- California Natural Diversity Database (CNDDDB). 2013. Rarefind. California Department of Fish and Wildlife, Biogeographic Data Branch.
- Dalby, S. R., T. E. McMahon, and W. Fredenberg. 1996. Effect of electrofishing pulse shape and electrofishing-induced spinal injury on long-term growth and survival of wild rainbow trout. *North American Journal of Fisheries Management* 16:560-569.
- eBird. View and Explore Data. <http://ebird.org/ebird/eBirdReports?cmd=Start>. Accessed February 2013.
- EDAW, Inc. 2007a. Final Baseline Biological Conditions Report Santa Clara Valley Water District Sunnyvale East Channel and Sunnyvale West Channel Flood Protection Project. Prepared for the Santa Clara Valley Water District. September 2007.
- . 2007b. Draft Alviso Slough Restoration Project Fisheries and Aquatic Resources Technical Report.
- . 2008. Draft Summary of the 2007-2008 Burrowing Owl Studies for the Santa Clara Valley Water District. Prepared for the Santa Clara Valley Water District.
- Eddleman, W. R. 1989. Biology of the Yuma Clapper Rail in the southwestern U.S. and northwestern Mexico. Final Report, Intra-Agency Agreement No. 4-AA-30-02060, United States Bureau of Reclamation, Yuma Project Office, Yuma, AZ.
- Evens, J. and G. Page. 1983. The ecology of clapper rail populations at Corte Madera Ecological Preserve with recommendations for management. Report prepared for Marin Audubon Society. 62 pp.
- Evens, J. and G. Page. 1986. Predation on black clapper rails during high tides in salt marshes. *Condor* 88:107-109.
- Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.
- Findley, J. S. 1955. Speciation of the wandering shrew. *Occasional Papers of the Museum of Natural History* 9:1-68.
- Geissel, W., H. Shellhammer, and H. T. Harvey. 1988. The ecology of the salt-marsh harvest mouse (*Reithrodontomys raviventris*) in a diked salt marsh. *Journal of Mammalogy* 69(4):696-703.
- H. T. Harvey & Associates. 1989. California Clapper Rail Breeding Survey, South San Francisco Bay. Prepared for Larry Walker & Associates and CH2M Hill. September 1989.

- . 1990a. San Jose Permit Assistance Program California Clapper Rail 1990 Breeding Survey. Prepared for CH2M Hill.
- . 1990b. San Jose Permit Assistance Program California Clapper Rail 1990 Winter Survey. Prepared for CH2M Hill.
- . 1990c. San Jose Permit Assistance Program Salt Marsh Harvest Mouse Trapping Surveys, August to October 1990. Prepared for CH2M Hill.
- . 1991. Sunnyvale Permit Assistance Program California Clapper Rail Breeding Survey 1990 and 1991, Guadalupe Slough. Prepared for EOA, Inc.
- . 1997. Red-legged Frog Distribution and Status - 1997. Prepared for the Santa Clara Valley Water District.
- . 1999a. Santa Clara Valley Water District California Tiger Salamander Distribution and Status – 1999. Prepared for the Santa Clara Valley Water District.
- . 1999b. Santa Clara Valley Water District Foothill Yellow-legged Frog Distribution and Status - 1999. Prepared for the Santa Clara Valley Water District.
- . 2010. Santa Clara Valley Water District San Francisco Dusky-footed Woodrat Distribution and Status - 2010. Prepared for the Santa Clara Valley Water District.
- . 2011a. Santa Clara Valley Water District Stream Maintenance Program Biological Assessment. July 2012.
- . 2011b. Santa Clara Valley Water District Stream Maintenance Program Biological Assessment/Essential Fish Habitat Assessment. January 2012.
- . 2011c. Santa Clara Valley Water District Stream Maintenance Program California Endangered Species Act Incidental Take Permit Application. September 2011.
- . 2011d. Sunnyvale East and West Channels Flood Protection Project – Habitat Assessment. February 2011.
- . 2012a. Santa Clara Valley Water District Western Pond Turtle Site Assessments and Surveys at Selected Santa Clara County Locations. Prepared for the Santa Clara Valley Water District. October 2012.
- . 2012b. Santa Clara Valley Water District Western Pond Turtle Site Assessments and Surveys at Selected Santa Clara County Locations. Prepared for the Santa Clara Valley Water District. October 2012.
- . 2013. Sunnyvale East and West Channels Flood Protection Project – Preliminary Identification of Wetland and Other Waters. February 2013.

- Hedgecock, D. 2002. Provenance Analysis of Chinook Salmon (*Oncorhynchus tshawytscha*) in the Santa Clara Valley Watershed. Bodega Marine Laboratory, University of California at Davis.
- Hobbs, J. A., P. Moyle, and N. Buckmaster. 2012. Monitoring the Response of Fish Communities to Salt Pond Restoration: Final report. Prepared for the South Bay Salt Pond Restoration Program and Resource Legacy Fund. University of California, Davis, CA.
- Hunter, J. E., D. Fix, G. A. Schmidt, and J. C. Power. 2005. Atlas of the Breeding Birds of Humboldt County, California. Redwood Region Audubon Society, Eureka, California.
- ICF. 2012. Final Santa Clara Valley Habitat Plan. Prepared for the City of Gilroy, City of Morgan Hill, City of San Jose, County of Santa Clara, Santa Clara Valley Transportation Authority, and Santa Clara Valley Water District.
- Jennings, M. R., and M. P. Hayes. 1994. Amphibian and reptile species of special concern in California. California Department of Fish and Game, Inland Fisheries Division.
- National Marine Fisheries Service (NMFS). 1999. Endangered and threatened species; threatened status for two Chinook salmon evolutionarily significant units (ESUs) in California; Final rule. Federal Register 64:50394-50415.
- Natural Resources Conservation Service. 2010. Brief Soil Description (CA), Santa Clara Area, California, Western Part. Tabular Data Version, 27 July 2010. U.S. Department of Agriculture. Available: <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>.
- Olofson Environmental, Inc. 2011. California Clapper Rail Surveys for the San Francisco Estuary Invasive Spartina Project 2011. Prepared for the State Coastal Conservancy San Francisco Estuary Invasive Spartina Project. December 2011.
- Pacific Fishery Management Council. 1998. The Coastal Pelagic Species Fishery Management Plan. Portland, Oregon.
- Pacific Fishery Management Council. 1999. Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon and California as Revised through Amendment 14. Portland, Oregon.
- Pacific Fishery Management Council. 2008. Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery as amended through Amendment 19. Portland, Oregon.
- Rankin, G. and J. Hillman. 2000. In-stream Wetland Vegetation Regrowth Study, Second Annual for 1999. Santa Clara Valley Water District. September.

- Rottenborn, S. C. 2007. Savannah sparrow *Passerculus sandwichensis*. in W. G. Bousman, editor. Breeding Bird Atlas of Santa Clara County. Santa Clara Valley Audubon Society, Cupertino, California.
- San Francisco Bay Bird Observatory (SFBBO). 2012. Determining the Breeding Extent of the San Francisco Common Yellowthroat and the Alameda Song Sparrow in Santa Clara County, California. December.
- Santa Clara County Bird Data. Unpublished Data compiled by William G. Bousman for the Santa Clara Valley Audubon Society.
- Santa Clara Valley Water District (SCVWD). 2000. The Species Composition, Abundance and Distribution of Wildlife at Salt Evaporator Ponds A4, A5 and A8, Alviso California: with Notes on the Status of Listed Species. Prepared by Thomas P. Ryan, District Biologist. December.
- . 2001. Pond A-4 Tidal Wetland Restoration Project Fish Sampling Report. January 2001. Prepared by Jason Nishijima, Biologist, for Louisa Squires, Wetland Specialist.
- . 2008. Fish Relocations for Stream Maintenance Program 2008.
- . 2011. Final Subsequent Environmental Impact Report for the Multi-Year Stream Maintenance Program Update 2012-2022.
- Sawyer, J. O., T. Keeler-Wolf, and J. M. Evens. 2009. A Manual of California vegetation. 2nd edition. California Native Plant Society, Sacramento, California.
- Shellhammer, H.S. 2000. Salt marsh wandering shrew, *Sorex vagrans halicoetes* in P. R. Olofson, editor. Goals Project. Baylands Ecosystem Species and Community Profiles: Life Histories and Environmental Requirements of Key Plants, Fish and Wildlife. San Francisco Bay Area Wetlands Ecosystem Goals Project. San Francisco Bay Regional Water Quality Control Board, Oakland, California.
- Shuford, W. D., and T. Gardali, editors. 2008. California Bird Species of Special Concern: A Ranked Assessment of Species, Subspecies, and Distinct Populations of Birds of Immediate Conservation Concern in California. Western Field Ornithologists and California Department of Fish and Game, Camarillo and Sacramento, California.
- Soil Conservation Service (SCS). 1968. Soils of Santa Clara County, California. U.S. Department of Agriculture.
- South Bay Birds List-serve. 2013. Available: <http://groups.yahoo.com/group/south-bay-birds/>. Accessed March 12, 2013.

- State Water Resources Control Board (SWRCB). 2013. Preliminary Draft Water Quality Control Policy for Wetland Area Protection and Dredged or Fill Permitting.
- Stillwater Sciences. 2006. Upper Penitencia Creek Limiting Factors Analysis Final Technical Report. Prepared for Santa Clara Valley Urban Runoff Pollution Prevention Program.
- U.S. Army Corps of Engineers (USACE). 2008. Final Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0). September. U.S. Army Engineer Research and Development Center.
- U.S. Fish and Wildlife Service (USFWS). 1992. Breeding Census for the California Clapper Rail (*Rallus longirostris obsoletus*) at Naval Air Station Moffett Field and Guadalupe Slough.
- . 2005a. Draft list of bird species to which the Migratory Bird Treaty Act does not apply. Federal Register 70:372-377.
- . 2005b. Endangered and threatened wildlife and plants: Designation of critical habitat for seven evolutionarily significant units of Pacific salmon and steelhead in California. Federal Register 70: 52488-52627.
- U.S. Fish and Wildlife Service and California Department of Fish and Game (USFWS and CDFG). 2007. South Bay Salt Ponds Restoration Project Final Environmental Impact Statement/Report. Prepared by EDAW, Philip Williams and Associates, Ltd., H. T. Harvey & Associates, Brown and Caldwell, and Geomatrix.
- Unitt, P. 1987. *Empidonax traillii extimus*: An endangered species. Western Birds 18:137-162.
- Wernette, F. G. 2000. Longfin smelt in P. R. Olofson, editor. Goals Project. Baylands Ecosystem Species and Community Profiles: Life Histories and Environmental Requirements of Key Plants, Fish and Wildlife. San Francisco Bay Area Wetlands Ecosystem Goals Project. San Francisco Bay Regional Water Quality Control Board, Oakland, California.

Personal Communications

- Hall, Laurie. 2013. pers. comm. to Scott Demers, January 22, 2013.
- Hernandez, T. 2012. (SCVWD) pers. comm. to R. Jolley, November 15, 2012.
- Zedler, Emily. 2013. (SCVWD) pers. comm. to R. Jolley, March 2013.

Chapter 3.4 Cultural Resources

- Bean, L.J. 1994. *The Ohlone Past and Present: Native Americans of the San Francisco Bay Region*. Ballena Press, Menlo Park, California. Bean, W., and J. Rawls. 1988. *California: An Interpretive History*. (5th edition.) New York, NY: McGraw-Hill.
- Bellifemine, V. 1997. *Mortuary Variability in Prehistoric Central California: A Statistical Study of the Yukisma Site, CA-SCL-38*. Master's thesis, Department of Interdisciplinary Studies, San Jose State University, California.
- Byrd, B. and J. Berg. 2009. Continuation Sheet. Part of the Site Record for P-43-000032 (CA-SCL-12/H), the Ynigo Mound. Record on file at the Northwest Information Center, Sonoma State University, Rohnert Park, California.
- Cartier, R. R. 2002. The Sunnyvale Red Burial, CA-SCL-832. *Proceedings of the Society for California Archaeology* 15:49–52.
- Cerny, Susan D. 2007. *An Architectural Guidebook to San Francisco and the Bay Area*. Santa Barbara, California: Gibbs Smith Publishers.
- City of Sunnyvale. 2011. *Sunnyvale General Plan*. Sunnyvale, California.
- Clark, M. 1998. *Evaluative Archaeological Investigations at the San Bruno Mountain Mound Site, CA-SMA-40, South San Francisco, California*. San Francisco: Holman and Associates. Submitted to Terrabay Development. Copies available from Northwest Information Center, Department of Anthropology, Sonoma State University, Rohnert Park, California.
- Clark, M. and A.L. Reynolds. 2003. *Archaeological Investigations and Mitigative Data Recovery at CA-SCL-689 on Pulte Homes' Kenwood II Project Area, San José, California*. San Francisco: Holman and Associates,. Submitted to Pulte Home Corporation, Pleasanton, California. Copies available from Northwest Information Center, Department of Anthropology, Sonoma State University, Rohnert Park, California.
- Cook, S.F. 1943a. The Conflict between the California Indians and White Civilization, I: The Indian Versus the Spanish Mission. *Ibero-Americana* 21. Berkeley, California.
- Cook, S.F. 1943b. The Conflict between the California Indians and White Civilization, II: The Physical and Demographic Reaction of the Non-Mission Indians in Colonial and Provincial California. *Ibero-Americana* 22. Berkeley, California.
- Santa Clara County. 2012. *County of Santa Clara Historic Context Statement*. Department of Planning and Development, Planning Office. Originally prepared by Archives and Architecture, December 2004, and revised in February 2012. San José, California.

- Elsasser, A.B. 1978. Development of Regional Prehistoric Cultures. In *California*, R. F. Heizer, ed., pp. 37–57. *Handbook of North American Indians*. Vol. 8. Smithsonian Institution, Washington, D.C.
- Fitzgerald, R.T. and J. Porcasi. 2003. The Metcalf Site (CA-SCL-178) and Its Place in Early Holocene California Prehistory. *Society for California Archaeology Newsletter* 37 (4):27–31.
- Fitzgerald, R.T., T.L. Jones, and A. Schroth. 2005. Ancient Long Distance Trade in Western North America: New AMS Radiocarbon Dates from Southern California. *Journal of Archaeological Science* 32:423–434.
- Fredrickson, D.A. 1973. Early Cultures of the North Coast of the North Coast Ranges, California. Ph.D. Dissertation, Department of Anthropology, University of California, Davis, California.
- Hildebrandt, W.R. 1983. *Final Report, Archaeological Research of the Southern Santa Clara Valley Project: Based on a Data Recovery Program from Sites CA-SCL-54, CA-SCL-163, CA-SCL-178, CA-SCL-237, and CA-SCL-241 Located in the Route 101 Corridor, Santa Clara County, California*. Report on file, California Department of Transportation, Oakland.
- Hylkema, M.G. 2002. Tidal Marsh, Oak Woodlands, and Cultural Florescence in the Southern San Francisco Bay Region. *Catalysts to Complexity: Late Holocene Societies of the California Coast*, J. M. Erlandson and T. L. Jones, eds., Los Angeles, California: Cotsen Institute of Archaeology, University of California, Los Angeles.
- King, C.D. 1978. Historical Indian Settlements in the Vicinity of the Holiday Inn Site. In J.C. Winter (Ed.) *Archaeological Investigations at CA-SCL-128, the Holiday Inn Site*.
- Kroeber, A.L. 1955. Nature of the Land-Holding Group. *Ethnohistory* 2:303–314.
- Laffey Architectural Archives. 1992. *Historical Context Statement—City of San José, California*. Available: <http://www.laffeyarchives.org/>. Accessed February 2013.
- Levy, R. 1978. Costanoan. In *California*, edited by R. F. Heizer, pp. 485–495. *Handbook of North American Indians*, Vol. 8, W.C. Sturtevant, general ed. Smithsonian Institution, Washington, D.C.
- Loud, L.L. 1912a. Archaeological Site Survey Record for P-43-000048 (CA-SCL-28). Record on file at the Northwest Information Center, Sonoma State University, Rohnert Park, California.

- . 1912b. Archaeological Site Survey Record for P-43-000028 (CA-SCL-8). Record on file at the Northwest Information Center, Sonoma State University, Rohnert Park, California.
- . 1912c. Archaeological Site Survey Record for P-43-00029 (CA-SCL-9). Record on file at the Northwest Information Center, Sonoma State University, Rohnert Park, California.
- Milliken, R. 1995. A Time of Little Choice: The Disintegration of the Tribal Culture in the San Francisco Bay Area 1769–1810. In *Ballena Press Anthropological Papers* No. 43, edited by Thomas C. Blackburn. Novato, California.
- Milliken, R., R.T. Fitzgerald, M.G. Hylkema, R. Groza, T. Origer, D.G. Bieling, A. Leventhal, R.S. Wiberg, A. Gottsfield, D. Gillette, V. Bellifemine, E. Strother, R. Cartier, and D.A. Fredrickson. 2007. Chapter 8: Punctuated Change in the San Francisco Bay Area, Pages 99–123 in Terry L. Jones and Kathryn A. Klar (eds.), *California Prehistory: Colonization, Culture, and Complexity*, Altamira Press, New York.
- Office of Historic Preservation (OHP). 1995. *Instructions for Recording Historical Resources*. Office of Historic Preservation, Sacramento, California.
- OHP. See Office of Historic Preservation.
- Payne, Stephen. 2008. *Santa Clara County: Harvest of Change*. American Historical Press, Sun Valley, California.
- Rosenthal, J.S. and J. Meyer 2004. Landscape Evolution and the Archaeological Record: A Geoarchaeological Study of the Southern Santa Clara Valley and Surrounding Region. Center for Archaeological Research at Davis Publication no. 14. University of California, Davis.
- Santa Clara County. 2012. *County of Santa Clara Historic Context Statement*. Department of Planning and Development, Planning Office. Originally prepared by Archives and Architecture, December 2004, and revised in February 2012. San José, California.
- Santa Clara County Flood Control and Water District. 1959-1976. *Construction Plans for Sunnyvale Outfall East; Construction Plans for Sunnyvale Outfall West*. Available at the Santa Clara Valley Water District Offices.
- Santa Clara Valley Water District. 2012. *History of Santa Clara Valley Water District*. Available: <http://www.valleywater.org/About/History.aspx>. Accessed February 2013.
- SCVWD. See Santa Clara Valley Water District.

Vellanoweth, R.L. 2001. AMS Radiocarbon Dating and Shell Bead Chronologies: Middle Holocene Trade and Interaction in Western North America. *Journal of Archaeological Science* 28:941–950.

Chapter 3.5 Geology and Soils

California Building Standards Commission. 2013. *California Code of Regulations (CCR), Title 24* – webpage. Available: <http://www.bsc.ca.gov/codes.aspx>. Accessed July 3, 2013.

California Geological Survey. 2006. State of California Seismic Hazard Zones Mountain View Quadrangle. Available: http://gmw.consrv.ca.gov/shmp/download/pdf/ozn_mview.pdf. Accessed December 10, 2012.

City of Sunnyvale. 2008. Seismic Safety and Safety Sub-Element of the Community Development Element. Available: <http://sunnyvale.ca.gov/Portals/0/Sunnyvale/CodesAndPolicies/GeneralPlan/2.4SeismicSubelementFINAL61008.pdf>. Accessed December 10, 2012.

Santa Clara Valley Water District (SCVWD). 2008a. *Geotechnical Investigation Report Sunnyvale East Channel Flood Protection Project – Planning Study, Project No. 26074002-1211*. Santa Clara Valley Water District, Capital Program Services Geotechnical Group.

———. 2008b. *Geotechnical Investigation Report Sunnyvale West Channel Flood Protection Project – Planning Study, Project No. 26074002-1211*. Santa Clara Valley Water District. Capital Program Services Geotechnical Group.

———. 2012. *Geotechnical Investigation Report Sunnyvale East and West Channels Flood Protection Project*. Project No. 2607 4002. Prepared by AMEC Geomatrix, Inc and Parikh Consultants, Inc.

SCVWD. See Santa Clara Valley Water District.

U.S. Geologic Survey (USGS), Earthquake Hazards Program. 2008. 2008 Bay Area Earthquake Probabilities. Available: <http://earthquake.usgs.gov/regional/nca/ucerf/>. Accessed December 10, 2012.

U.S. Army Corps of Engineers (USACE). 2000. Table 6-1b: Minimum Factors of Safety – Levee Slope Stability. In: *Engineering and Design: Design and Construction of Levees*. EM 1110-2-1913. Available: http://140.194.76.129/publications/engineering-manuals/EM_1110-2-1913_sec/Sections/basdoc.pdf. Accessed December 10, 2012.

USACE. See U.S. Army Corps of Engineers.

USGS. See U.S. Geologic Survey.

Chapter 3.6 Greenhouse Gas Emissions

BAAQMD. See Bay Area Air Quality Management District.

Bay Area Air Quality Management District (BAAQMD). 2009 (December 7). *California Environmental Quality Act Guidelines Update, Proposed Thresholds of Significance*. Available:
<http://www.baaqmd.gov/~media/Files/Planning%20and%20Research/CEQA/Proposed%20Thresholds%20of%20Significance%20Dec%207%2009.ashx>. Accessed March 20, 2013.

———. 2010. *California Environmental Quality Act, Air Quality Guidelines*. May. Available:
http://www.baaqmd.gov/~media/Files/Planning%20and%20Research/CEQA/Draft_BAAQMD_CEQA_Guidelines_May_2010_Final.ashx. Accessed January 3, 2013.

California Climate Change Center. 2012. *Our Changing Climate 2012: Vulnerability & Adaptation to the Increased Risks from Climate Change in California*. Available:
<http://www.energy.ca.gov/2012publications/CEC-500-2012-007/CEC-500-2012-007.pdf>. Accessed January 7, 2013.

California Department of Finance. 2012. Interim Population Projections. Available:
<http://www.dof.ca.gov/research/demographic/reports/projections/interim/view.php>. Accessed: January 7, 2013.

California Air Resources Board (CARB). 2008. *Preliminary Draft Staff Proposal: Recommended Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under the California Environmental Quality Act*. Available:
<http://www.arb.ca.gov/cc/localgov/ceqa/meetings/102708/prelimdraftproposal102408.pdf>. Accessed January 7, 2013.

———. 2011a. *Climate Change Scoping Plan*. Available:
http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf. Accessed March 20, 2013.

———. 2011b. *California Greenhouse Gas Emissions Inventory: 2000–2009*. Available:
http://www.arb.ca.gov/cc/inventory/pubs/reports/ghg_inventory_00-09_report.pdf. Accessed January 7, 2013.

CARB. See California Air Resources Board.

EPA. See U.S. Environmental Protection Agency.

IPCC. See Intergovernmental Panel on Climate Change.

Intergovernmental Panel on Climate Change (IPCC). 2007. *Climate Change 2007 – The Physical Science Basis*. Available:

http://www.ipcc.ch/publications_and_data/ar4/wg1/en/contents.html. Accessed January 7, 2013.

PMC. 2011. *City of Sunnyvale Draft Climate Action Plan*. Prepared for City of Sunnyvale, Community Development Department. November. Available:

http://www.pmcworld.com/client/sunnyvale/documents/cap/Sunnyvale-CAP_draft-11-2011.pdf. Accessed January 7, 2013.

U.S. Environmental Protection Agency (EPA). 2008. *Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance: Direct Emissions from Mobile Combustion Sources*. Available:

http://www.epa.gov/climateleadership/documents/resources/mobilesource_guidance.pdf. Accessed January 7, 2013.

———. 2012. Regulatory Initiatives. Available:

<http://www.epa.gov/climatechange/EPAactivities/regulatory-initiatives.html>. Accessed January 7, 2013.

Chapter 3.7 Hazards and Hazardous Materials

California Department of Toxic Substances Control (DTSC). 2012a. *Envirostor Site/Facility Search*. Search of active contaminated sites within 1,000 feet from the Sunnyvale East and West Channels. Available:

<http://www.envirostor.dtsc.ca.gov/public/search.asp?basic=True>. Accessed June 13, 2012.

———. 2012b. *Envirostor Commercial Offsite Hazardous Waste Facilities*. Available:

http://www.envirostor.dtsc.ca.gov/public/commercial_offsite.asp. Accessed June 13, 2012. Last posted or revised in 2007.

City of Sunnyvale. 2011. *Sunnyvale General Plan*. July. Available:

<http://www.sunnyvale.ca.gov/CodesandPolicies/GeneralPlan.aspx>. Accessed: June 10, 2012.

———. 2012a. City of Sunnyvale Hazardous Materials Unit. Available:

<http://sunnyvale.ca.gov/Departments/PublicSafety/FirePrevention/HazardousMaterialsCompliance.aspx>. Accessed March 14, 2013.

———. 2012b. City of Sunnyvale Department of Public Safety Fire Services Bureau. Available:

- <http://sunnyvale.ca.gov/Departments/PublicSafety/DPSDivisions/Fire.aspx>. Accessed June 13, 2012.
- County of Santa Clara Office of the Fire Marshall. 2012. Santa Clara County Wildland Urban Interface. Available: <http://www.sccgov.org/sites/fmo/Wildland%20Urban%20Interface/Pages/Santa-Clara-County-Wildland-Urban-Interface.aspx>. Accessed June 13, 2012.
- DTSC. See California Department of Toxic Substances Control.
- EPA. See U.S. Environmental Protection Agency.
- National Center for Education Statistics (NCES). 2013. Search for Schools, Colleges, and Libraries. Available: <http://nces.ed.gov/globallocator/>. Accessed March 5, 2013.
- NCES. See National Center for Education Statistics.
- Santa Clara Valley Water District (SCVWD). 2013 (January 22). Sunnyvale East Channel and West Channel Flood Protection Project Meeting with City of Sunnyvale. Meeting Minutes.
- SCVWD. See Santa Clara Valley Water District.
- State Water Resources Control Board (SWRCB). 2012. *Geotracker*. Search of active LUST, Other Cleanup Sites, and Permitted Underground Storage Tank Facilities within 1,000 feet from the Sunnyvale East and West Channels. Available: <http://geotracker.waterboards.ca.gov/>. Accessed: June 13, 2012.
- SWRCB. See State Water Resources Control Board.
- The King's Academy. 2012. 2010–2011 School Profile. Available: http://www.tka.org/uploaded/Academics/KIN65_StudentProfile_LR_6pg.pdf. Accessed June 12, 2012.
- TRC. See TRC Solutions.
- TRC Solutions. 2007. *Environmental Site Assessment Sunnyvale East and West Channels, Sunnyvale, CA*. Prepared for the Santa Clara Valley Water District.
- U.S. Environmental Protection Agency (EPA). 2013. Pacific Southwest, Region 9: Superfund - Naval Air Station Moffett Field. Available: <http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/3dec8ba3252368428825742600743733/c01ef2be6ec9ab9c8825737f002bf719!OpenDocument>. Accessed March 14, 2013.

Chapter 3.8 Hydrology, Geomorphology & Water Quality

BCDC. See San Francisco Bay Conservation and Development Commission.

CH2M Hill. 2005. *Pond A4, Moffett Channel, Guadalupe Slough Sediment and Water Quality Sampling Report*. Prepared for Santa Clara Valley Water District.

City of Sunnyvale. 2011. *Sunnyvale General Plan*. July. Available:
<http://www.sunnyvale.ca.gov/CodesandPolicies/GeneralPlan.aspx>. Accessed February 2013.

Federal Emergency Management Agency (FEMA). 2010. NFIP Policy Index. Available:
<http://www.fema.gov/plan/prevent/floodplain/nfipkeywords/freeboard.shtm>. Accessed June 22, 2012.

FEMA. See Federal Emergency Management Agency.

Intergovernmental Panel on Climate Change (IPCC). 2007. *Climate Change 2007: The Physical Science Basis*. Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller, eds. Available:
http://www.ipcc.ch/publications_and_data/ar4/wg1/en/contents.html. Accessed June 21, 2012.

IPCC. See Intergovernmental Panel on Climate Change.

Michael Johnson, LLC. 2011. *Technical Memo: Sunnyvale East Channel and Sunnyvale West Channel Flood Protection Project Water Quality Sampling*. Prepared for: Santa Clara Valley Water District.

San Francisco Bay Conservation and Development Commission (BCDC). 2009. *Shoreline Areas Potentially Exposed to Sea Level Rise: South Bay*. Available:
http://www.bcdc.ca.gov/planning/climate_change/maps/16_55/south_bay.pdf. Accessed June 20, 2012

———. 2011. *San Francisco Bay Plan*. Available:
http://www.bcdc.ca.gov/laws_plans/plans/sfbay_plan.shtml. Updated October 2011. Accessed June 20, 2012

San Francisco Bay Regional Water Quality Control Board (San Francisco Bay RWQCB). 2008. *San Francisco Bay Mercury TMDL*. Available:
http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/sfbaymercurytmdl.shtml. Last revised 2010. Accessed August 19, 2010.

- . 2009a. *San Francisco Bay Region Municipal Regional Stormwater NPDES Permit*. Available:
http://www.swrcb.ca.gov/sanfranciscobay/water_issues/programs/stormwater/mrp.shtml. Last revised October 14, 2009. Accessed June 20, 2012.
- . 2009b. *Classification of Subwatersheds and Catchments for Determining Applicability of HMP Requirements*. Available:
http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/muni/mrp/Final%20TO%20HM%20Maps.pdf. Accessed March 19, 2013.
- . 2011a. *San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)*. Includes amendments as of December 31, 2011. Available:
http://www.waterboards.ca.gov/sanfranciscobay/basin_planning.shtml. Accessed June 19, 2012.
- . 2011b. *San Francisco Bay Region Municipal Regional Stormwater NPDES Permit*. Order R2-2011-083. Available:
http://www.swrcb.ca.gov/sanfranciscobay/water_issues/programs/stormwater/Municipal/index.shtml. Last posted or revised: November 28, 2011. Accessed June 19, 2012.
- Santa Clara Valley Water District (SCVWD). . 2010. *Sunnyvale East Channel and Sunnyvale West Channel Flood Protection Project Planning Study Report*. June.
- . 2012. *Geotechnical Investigation Report Sunnyvale East and West Channels Flood Protection Project*. Project No. 2607 4002. Prepared by AMEC Geomatrix, Inc and Parikh Consultants, Inc.
- . 2013a (January 22). Sunnyvale East Channel and West Channel Flood Protection Project Meeting with City of Sunnyvale. Meeting Minutes.
- . 2013b (May 6). Memorandum: Update on Moffett Field and Middlefield Ellis Whisman (MEW) Superfund Sites. From Joan Maher, Deputy Operating Officer: Water Supply Division to Jim Fielder, Chief Operating Officer: Water Utility Enterprise.
- SCVWD. See Santa Clara Valley Water District.
- State Water Resources Control Board (SWRCB). 2011. *California 2010 Integrated Clean Water Act Section 303(d) List of USEPA Approved Water Quality Limited Segments*. Available:
http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml. Last posted or revised November 1, 2011. Accessed June 19, 2012.
- . 2012. *Geotracker*. Search of active LUST, Other Cleanup Sites, and Permitted Underground Storage Tank Facilities within 1,000 feet from the Sunnyvale East and

- West Channels. Available: <http://geotracker.waterboards.ca.gov/>. Accessed June 13, 2012.
- SWRCB. See State Water Resources Control Board.
- Tetra Tech EM, Inc. 2004. *Final Technical Memorandum, Site 1 Groundwater Evaluation Process, Former Naval Air Station Moffett Field, California*.
- TRC Solutions. 2007. *Environmental Assessment Sunnyvale East and West Channels, Sunnyvale, CA*. Prepared for the Santa Clara Valley Water District. U.S. Army Corps of Engineers (USACE). 1984. San Francisco Bay: Tidal Stage vs. Frequency Study. San Francisco District. October. San Francisco, CA.
- . 2002. *Planning for Sea Level Rise: U.S. Army Corps of Engineers Policy*. Available: <http://cedb.asce.org/cgi/WWWdisplay.cgi?0200347>. Accessed June 21, 2012.
- USACE. See U.S. Army Corps of Engineers.
- U.S. Army Corps of Engineers (USACE). 1984. Shore Protection Manual. Volume 1. Coastal Engineering Center. Waterways Experiment Station. Vicksburg, Mississippi.

Personal Communications

- Ferranti, Stephen. Managing Engineer. Santa Clara Valley Water District, San José, CA. January 24, 2013—telephone conversation with Ryan Jolley of Horizon Water and Environment regarding flooding events on the Sunnyvale East and West Channels.
- Zedler, Emily. Engineer. Santa Clara Valley Water District, San José, CA. January and February 2013—series of e-mails exchanged Ryan Jolley of Horizon Water and Environment regarding water surface elevations, depth to groundwater data, and existing erosion sites.

Chapter 3.9 Land Use and Planning

- BCDC. See San Francisco Bay Conservation and Development Commission.
- California Department of Transportation (DOT). 2010. *Encroachment Permits: Manual for Encroachment Permits on California State Highways*. Available: http://www.dot.ca.gov/hq/traffops/developserv/permits/encroachment_permits_manual/index.html. Accessed March 19, 2013.
- City of Sunnyvale. 2004. *Moffett Park Specific Plan*. Available: <http://sunnyvale.ca.gov/Portals/0/Sunnyvale/CDD/Non-Residential/MoffettParkSpecificPlan1.pdf>. Accessed January 10, 2013.

- . 2011. *Sunnyvale General Plan*. July. Available: <http://www.sunnyvale.ca.gov/CodesandPolicies/GeneralPlan.aspx>. Accessed: June 10, 2012.
- DOT. See California Department of Transportation.
- San Francisco Bay Conservation and Development Commission. 2011. San Francisco Bay Plan. Available: http://www.bcdc.ca.gov/laws_plans/plans/sfbay_plan.shtml. Accessed March 19, 2013.
- Santa Clara Valley Water District (SCVWD). 2010. *Sunnyvale East Channel and Sunnyvale West Channel Flood Protection Project Planning Study Report*. June. Available: http://www.valleywater.org/uploadedFiles/Services/FloodProtection/Projects/SunnyvaleEastandWestChannelsFloodProtectionProject/ReportsandDocuments/Final_PSR_with_Appendices_2010_07_15_lz.pdf?n=1693. Accessed: July 10, 2013.

Chapter 3.10 Noise and Vibrations

- California Department of Transportation (Caltrans). 2004 (June). *Transportation and Construction-Induced Vibration Guidance Manual*. Division of Environmental Analysis.
- . 2009. *Technical Noise Supplement*. Prepared by ICF Jones & Stokes. November. Available: http://www.dot.ca.gov/hq/env/noise/pub/tens_complete2009RedlineScreenProcess.pdf. Accessed August 14, 2012.
- City of Sunnyvale. 2011. Sunnyvale General Plan. Available: <http://sunnyvale.ca.gov/Departments/CommunityDevelopment/CurrentProjectsandHearings/GeneralPlanConsolidation.aspx>. Accessed January 2, 2013.
- Federal Highway Administration (FHWA). 2006. FHWA Roadway Construction Noise Model User's Guide. FHWA-HEP-05-054. January. Prepared by U.S. Department of Transportation, Research and Innovative Technology Administration.
- Federal Transit Administration (FTA). 2006. *Transit Noise and Vibration Impact Assessment*. FTA-VA-90-1003-06. Office of Planning and Environment.
- FHWA. See Federal Highway Administration.
- FTA. See Federal Transit Administration.

Chapter 3.11 Recreation

- Association of Bay Area Governments (ABAG). 2013. San Francisco Bay Trail. Available: <http://www.baytrail.org/overview.html>. Accessed June 25, 2013.
- City of Santa Clara. 2013a. Parks. Available: <http://santaclaraca.gov/index.aspx?page=1455>. Accessed: June 25, 2013.
- . 2013b. San Tomas Aquino Creek Trail Temporary Detour. Available: <http://santaclaraca.gov/index.aspx?page=50&recordid=2052>. Accessed: June 25, 2013.
- City of Sunnyvale. 2004. *Moffett Park Specific Plan*. Available: <http://sunnyvale.ca.gov/Portals/0/Sunnyvale/CDD/Non-Residential/MoffettParkSpecificPlan1.pdf>. Accessed January 10, 2013.
- . 2006. *City of Sunnyvale 2006 Bicycle Plan*. Available: <http://sunnyvale.ca.gov/Portals/0/Sunnyvale/DPW/Transportation/SunnyvaleBicyclePlan2006.pdf>. Accessed January 24, 2013.
- . 2011. *Sunnyvale General Plan*. Available: <http://sunnyvale.ca.gov/CodesandPolicies/GeneralPlan.aspx>. Accessed June 8, 2012.
- . 2013a. Parks and Golf. Available: <http://sunnyvale.ca.gov/Departments/CommunityServices/Parks.aspx>. Accessed June 26, 2013.
- . 2013b. Sunnyvale Landfill and Birding Tours. Available: <http://sunnyvale.ca.gov/Departments/EnvironmentalServices/Garbage,RecyclingandWasteReduction/SMaRTStation/SunnyvaleLandfillandBirdingTours.aspx>. Accessed June 26, 2013.
- International City/County Management Association (ICMA). 2006. Sunnyvale Completes Calabazas Creek Trail. Available: http://icma.org/en/Article/10191/Sunnyvale_Completes_Calabazas_Creek_Trail. Accessed: June 25, 2013.
- Santa Clara County Parks and Recreation Department (Santa Clara Parks). 1995. *Santa Clara County Countywide Trails Master Plan Update*. Available: http://www.sccgov.org/sites/parks/Future%20Plans%20Here/Documents/Entire_Countywide_Trails_Master_Plan_Searchable.pdf. Accessed March 8, 2013.
- Twin Creeks Sports Complex. 2012. About Twin Creeks. Available: <http://twin-creeks.com/About-Twin-Creeks.html>. Accessed June 8, 2012.

U.S. Fish and Wildlife Service (USFWS). 2013. Don Edwards San Francisco Bay National Wildlife Refuge: Visitor Activities. Available:
http://www.fws.gov/refuge/don_edwards_san_francisco_bay/activities.html.
Accessed: June 27, 2013.

Chapter 3.12 Traffic and Transportation

California Department of Transportation (Caltrans). 2002 (December). *Guide for the Preparation of Traffic Impact Studies*.

———. 2011. Traffic and Vehicle Data Systems Unit. 2011 Annual Average Daily and Peak-Hour Traffic Volumes. Traffic Operations Division. Available:
<http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/2011all/index.html>. Accessed February 2013.

Caltrans. See California Department of Transportation.

City of Sunnyvale. 2010 (June 10). *Existing Transportation Conditions Report for Land Use and Transportation Element Update*. Available:
<http://www.pmcworld.com/client/sunnyvale/documents/meetings/2010/082510/Horizon-2035-Transportation-Existing-Conditions.pdf>. Accessed February 2013.

———. 2011. *Sunnyvale General Plan*. Adopted in July 2011. Available:
<http://www.sunnyvale.ca.gov/CodesandPolicies/GeneralPlan.aspx>. Accessed February 2013.

———. 2013. Traffic Counts Map. Division of Transportation and Traffic. Available:
<http://www.bing.com/maps/?form=MPSRCH&cp=37.382321~-122.038804&lvl=13&style=u&cid=2FD89D700306FD4F1121>. Accessed February 2013.

ICF International. 2013. See Appendix J of this DEIR.

Santa Clara Valley Transportation Authority (VTA). 2009. *Transportation Impact Analysis Guidelines for Congestion Management Program*. Adopted May 1998. Updated March 2009.

———. 2011a (May). *2010 Annual Monitoring and Conformance Report*.

———. 2011b. Bikeways Map. Effective April 2011. Available:
http://www.vta.org/bike_information/maps.html. Accessed February 2013.

———. 2012 (June). *2011 Annual Monitoring and Conformance Report*.

———. 2013. Bus and Rail Map. Effective January 7, 2013. Available:
http://www.vta.org/schedules/schedules_bymap.html. Accessed February 2013.

Transportation Research Board. 2000. *Highway Capacity Manual*. Special Report 209.
National Research Council. Washington, DC.

VTA. See Santa Clara Valley Transportation Authority.

Chapter 3.13 Utilities and Service Systems

California Department of Resources Recycling and Recovery (CDRRR). 2013. Solid Waste Information System (SWIS) Online Database. Available:
<http://www.calrecycle.ca.gov/SWFacilities/Directory/>. Accessed: February 27, 2013.

City of San José. 2013. Construction and Demolition Diversion Program. Available:
<http://www.sanjoseca.gov/index.aspx?nid=1532>. Accessed February 28, 2013.

City of Sunnyvale. 2011. *Sunnyvale General Plan*. July. Available:
<http://ecityhall.sunnyvale.ca.gov/cd/GeneralPlan.pdf>. Accessed June 20, 2012.

———. 2012a. City of Sunnyvale Department of Environmental Services: Zero Waste. Available:
<http://sunnyvale.ca.gov/Departments/EnvironmentalServices/GarbageRecyclingandWasteReduction/WasteReductionandReuselIssues/ZeroWaste.aspx>. Accessed June 19, 2012.

———. 2012b. City of Sunnyvale Environmental Services: About the Water Pollution Control Plant. Available:
<http://sunnyvale.ca.gov/Departments/EnvironmentalServices/WaterPollutionControlPlant.aspx>. Accessed June 19, 2012.

Santa Clara County. 1994. *Santa Clara General Plan, Book A: Charting a Course for Santa Clara County's Future: 1995–2010*. Adopted December 20, 1994. Available:
http://www.sccgov.org/sites/planning/Plans%20-%20Programs/General%20Plan/Documents/GP_Book_A.pdf. Accessed September 21, 2012.

Santa Clara County Integrated Waste Management Division. 2010. Zero Waste 2020: A Vision Statement and Action Plan for Zero Waste in Santa Clara County. Available
http://www.sccgov.org/sites/iwm/Recycling%20and%20Waste%20Reduction%20Commission/Documents/SCCZeroWaste2020_10_08_12.pdf. Accessed: April 1, 2013.

Santa Clara Valley Water District (SCVWD). 2010. *Sunnyvale East Channel and Sunnyvale West Channel Flood Protection Project Planning Study Report*.

SCVWD. See Santa Clara Valley Water District.

State Water Resources Control Board (SWRCB). 2009a. California Regional Water Quality Control Board, San Francisco Bay Region, Order R2-2009-0061, NPDES Permit No. CA0037621. Available:

http://www.waterboards.ca.gov/sanfranciscobay/board_decisions/adopted_orders/2009/R2-2009-0061.pdf. Accessed June 20, 2012.

———. 2009b. California Regional Water Quality Control Board, San Francisco Bay Region, Order R2-2009-0074, NPDES Permit No. CAS612008. Available:

http://www.swrcb.ca.gov/rwqcb2/board_decisions/adopted_orders/2009/R2-2009-0074.pdf. Accessed June 20, 2012.

SWRCB. See State Water Resources Control Board.

Chapter 4.0 Other Statutory Considerations

City of Sunnyvale. 2006. *City of Sunnyvale 2006 Bicycle Plan*. Prepared by Korve Engineering. Available:

<http://sunnyvale.ca.gov/Portals/0/Sunnyvale/DPW/Transportation/SunnyvaleBicyclePlan2006.pdf>. Accessed January 24, 2013.

———. 2011. Sunnyvale General Plan. Available:

<http://sunnyvale.ca.gov/Departments/CommunityDevelopment/CurrentProjectsandHearings/GeneralPlanConsolidation.aspx>. Accessed January 2, 2013.

Santa Clara Valley Water District (SCVWD). 2013 (January 22). Sunnyvale East Channel and West Channel Flood Protection Project Meeting with City of Sunnyvale. Meeting Minutes.

Personal Communications

Chu, Judy. Senior Civil Engineer (P.E.). City of Sunnyvale Department of Public Works/Engineering, Sunnyvale, CA. February 19, 2013—e-mail to Stephen Ferranti of Santa Clara Valley Water District regarding the Sunnyvale Channels Flood Protection Project Cumulative Projects List.

Chapter 5.0 Alternatives

Santa Clara Valley Water District (SCVWD). 2010. *Sunnyvale East Channel and Sunnyvale West Channel Flood Protection Project Planning Study Report*. June.

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