Hamilton Wetland Restoration Project Dredged Material Aquatic Transfer Facility

Draft Supplemental Environmental Impact Statement/ Environmental Impact Report

October 2008

US Army Corps
of Engineers
San Francisco District

Coastal Conservancy

Hamilton Wetlands Restoration Project
Dredged Material Aquatic Transfer Facility
Marin County, California

Draft
Supplemental Environmental Impact Statement / Environmental Impact Report

This Supplemental Environmental Impact Statement/Environmental Impact Report (SEIS/EIR) evaluates alternative approaches for the Hamilton Wetlands Restoration Project Dredged Material Aquatic Transfer Facility (proposed project or proposed ATF). The federal lead agency is the U.S. Army Corps of Engineers, San Francisco District (USACE). The state lead agency is the California State Coastal Conservancy (Conservancy). As proposed by the USACE and Conservancy, and with support from the LTMS agencies, the proposed ATF would be used in restoring tidal wetlands at the Hamilton Wetlands Restoration Project (HWRP) site. This SEIS/EIR supplements the HWRP EIS/EIR (USACE, 1998) and the BMKV SEIS/EIR (USACE, 2003). The previously authorized HWRP provides for the construction of a dredged material off-loader facility to receive and transport dredged materials from San Francisco Bay Area dredging projects to the HWRP site. This SEIS/EIR identifies and analyzes potential impacts associated with multiple alternatives to the existing authorized off-loader. The proposed action is Alternative 2: Unconfined In-Bay ATF. This SEIS/EIR will support decision making by the USACE and Conservancy to implement the proposed ATF and to ensure compliance with the National Environmental Policy Act (NEPA), the California Environmental Quality Act (CEQA), and other pertinent laws and regulations.

Federal, state, and local agencies and the public will have an opportunity to comment on this document during a 45-day comment period from October 17, 2008 to December 1, 2008. Information on the project can be found on the Internet at http://wwwhamiltonweltands.org

Prepared by:
U.S. Army Corps of Engineers, San Francisco District
Environmental, Section A
1455 Market Street, San Francisco, CA 94103-1308
Contact: Cynthia Fowler at (415) 503-6870
or Fari Tabatabai at (415) 503-6860

California State Coastal Conservancy
1330 Broadway, 13th Floor, Oakland, CA 94612
Contact: Tom Gandesberry
(510) 286-1015

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Contents

Tables

Figures

Acronyms and Abbreviations

μg/g	micrograms per gram
μg/L	micrograms per liter
μg/m^3	micrograms per cubic meter
°C	degrees Celsius
-50-Foot Project	Oakland Harbor Navigation Improvement Project
ABAG	Association of Bay Area Government's
ac	acre
AFB	Air Force Base
AFCA	Anadromous Fish Conservation Act
Ag	silver
Air Quality Management Plan	AQMP
APE	Area of Potential Effect
ARB	Air Resources Board
As	arsenic
ASC	Ambient Sediment Concentration
ATF	aquatic transfer facility
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control technology
Bay Plan	San Francisco Bay Plan
Bay	San Francisco Bay
BCDC	San Francisco Bay Conservation and Development Commission
BLM	U.S. Bureau of Land Management
BMKV	Bel Marin Keys Unit V
BMP	Best Management Practice
BO	Biological Opinion
BRAC	Defense Base Closure and Realignment Act of 1988
C	Centigrade

CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Cal/EPA	California Environmental Protection Agency
CALFED	CALFED Bay-Delta Program
Caltrans	California Department of Transportation
CAR	Coordination Act Report
CCAA	California Clean Air Act
CCMP	Comprehensive Conservation and Management Plan
CCR	California Code of Regulations
Cd	cadmium
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
cm	centimeter
cm/sec	centimeters per second
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
Conservancy	California State Coastal Conservancy
CPRC	California Public Resources Code
CRHR	California Register of Historic Resources
CSLC	California State Lands Commission
CTT	Closed, Transferring and Transferred
Cu	copper
Cutterhead Dredges	cutterhead hydraulic pipeline dredges
CWA	Clean Water Act
cy	cubic yard
dB	decibel

dBA	A-weighted decibels
DDT	dichloro-diphenyl-trichloroethane
Delta	San Joaquin Delta
DHS	Department of Health Services
DMMO	Dredged Material Management Office
DO	dissolved oxygen
DODS	Deep Ocean Disposal Site
DPS	distinct population segment
East Span Project	San Francisco–Oakland Bay Bridge East Span Seismic Safety Project
EIR	environmental impact report
EPA	U.S. Environmental Protection Agency
ERL	Effects Range-Low
ESA	Federal Endangered Species Act
ESU	evolutionarily significant unit
F	Fahrenheit
FHWA	Federal Highway Administration
FMP	fishery management plan
FR	*Federal Register*
ft	feet
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
g	acceleration due to gravity
GHG	greenhouse gas
GIS	geographic information system
Goals Project	San Francisco Bay Area Wetlands Ecosystem Goals Project
GPS	global positioning system
ha	hectare
HCFC	halogenated fluorocarbons
HDPE	high-density polyethylene
HFC	hydrofluorocarbon
Hg	mercury
HAAF	Hamilton Army Airfield
HMD	hydraulic mining debris
hp	horsepower
HWRP	Hamilton Wetlands Restoration Project

I	Interstate
IPCC	Intergovernmental Panel on Climate Change
kg/s	kilograms per second
kJ	kilojoules
km	kilometer
km/h	kilometers/hour
L_{dn}	day-night sound level
L_{eq}	equivalent sound level
LESA	Land Evaluation Site Assessment
L_{max}	maximum sound levels
L_{min}	sound level
LTMS	Long-Term Management Strategy for Placement of Dredged Material in the San Francisco Bay Region
L_{xx}	percentile-exceeded sound levels
m	meter
m^3	cubic meters
MBTA	Migratory Bird Treaty Act
mcy	million cubic yards
MFCMA	Magnuson Fishery Conservation and Management Act
mg/kg	milligrams/kilogram
mg/L	milligrams per liter
MHEA	Middle Harbor Enhancement Area Project
MHHW	mean higher high water
MHW	mean high water
mi	mile
MLLW	mean lower low water
MLW	mean low water
mm	millimeters
Mm^3	million cubic meters
MMT/yr	million metric tons per year
MOA	Memorandum of Understanding
MOP	Marine Operations Plan
MOTEMS	Marine Oil Terminal Engineering and Maintenance Standards
mph	miles per hour
MPRSA	Marine Protections, Research, and Sanctuaries Act

mps	meters per second
mt/yr	million tons per year
MTL	mean tide level
mya	million years ago
N_2O	nitrous oxide
NA	not applicable
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NEP	National Estuary Program
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
Ni	nickel
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOAA-Fisheries	National Oceanic and Atmospheric Administration – Fisheries
NOC	Notice of Completion
NOI	Notice of Intent
NOP	Notice of Preparation
NO_X	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSD	Novato Sanitary District
NTU	Nephologmetric Turbidity Units
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
OPR	Office of Planning and Research
PAHs	polycyclic aromatic hydrocarbons
Pb	lead
PCBs	polychlorinated biphenyls
PFC	perfluorinated carbons
PG&E	Pacific, Gas and Electric
PGA	peak horizontal ground acceleration
pH	hydrogen ion activity

PIDP	pile installation demonstration project
PM_{10}	particulate matter
$PM_{2.5}$	fine particulate matter
ppm	parts per million
ppt	parts per thousand
PRG	Preliminary Remediation Goals
proposed project	Hamilton Wetlands Restoration Project Aquatic Transfer Facility
proposed ATF	Hamilton Wetlands Restoration Project Aquatic Transfer Facility
Qobm	Old Bay Mud
Qybm	Young Bay Mud
RM	River Mile
RMP	Regional Monitoring Program for Water Quality in the San Francisco Bay Estuary
RNA	Regulated Navigational Areas
ROD	Record of Decision
ROG	reactive organic gas
RPA	Registered Professional Archaeologist
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SCR	selective catalytic reduction
SEIS	supplemental environmental impact statement
SEIS/EIR	supplemental environmental impact statement/environmental impact report
SF-10	San Pablo Bay Disposal Site
SF-16	Suisun Bay Disposal Site
SF_6	sulfur hexaflouride
SF-8	Bar Channel Disposal Site
SF-9	Carquinez Strait Disposal Site
SFBAAB	San Francisco Bay Area Air Basin
SF-DODS	SF Deep Ocean Disposal Site
SFEP	San Francisco Estuary Project
SHPO	State Historic Preservation Office
SLC	State Lands Commission
SPL	sound pressure level
STFATE	Short-Term Fate
SVOC	semi-volatile organic compound

SVP	Society of Vertebrate Paleontology
SWRCB	State Water Resources Control Board
TAC	toxic air contaminant
TL	total length
TMDL	total maximum daily loads
UCD	University of California, Davis
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USSCS	U.S. Soil Conservation Service
VE	value engineering
VOC	volatile organic compound
VTIS	Vessel Traffic Information System
VTS	Vessel Traffic Service
WDR	waste discharge requirement
WRDA	Water Resources Development Act
Zn	zinc

Executive Summary

This executive summary provides a brief overview of the project purpose and need and project objectives; alternatives; environmental consequences of the proposed action and alternatives; plans and policy consistency; issues of public concern to be addressed or resolved, and major conclusions.

ES.1 Project Overview

This Supplemental Environmental Impact Statement/Environmental Impact Report (SEIS/EIR) evaluates alternative approaches to deliver dredged material to the Hamilton Wetlands Restoration Project (HWRP) [1]. This SEIS/EIR supplements the HWRP EIR/EIS (USACE 1998) and the Bel Marin Keys Unit V (BMKV) SEIS/EIR (USACE 2003). The U.S. Army Corps of Engineers (USACE) and California State Coastal Conservancy (Conservancy), in collaboration with the San Francisco Bay Conservation and Development Commission (BCDC), are proposing an aquatic transfer facility ([ATF] proposed action[2] or proposed ATF) to be used in restoring tidal wetlands at the HWRP site. The previously authorized HWRP provides for the use of a dredged material off-loader facility to receive and transport dredged materials from San Francisco Bay Area dredging projects to the HWRP. Should the proposed ATF be approved and constructed, it would be located in the same general vicinity as the existing in-Bay dredged material disposal site SF-10[3] (see Figure 1-1).

The authorized use of a hydraulic off-loader (Alternative 1: No Action) would accommodate dredged material pumped from dredge scows[4] docked adjacent to the floating off-loader and subsequently pumped as a slurry through a transfer pipeline to the HWRP site. The other three alternatives considered in this SEIS/EIR include: an unconfined aquatic transfer basin in San Pablo Bay with associated slurry pipeline (Alternative 2: Unconfined In-Bay ATF); a confined transfer basin in San Pablo Bay with associated slurry pipeline (Alternative 3: Confined In-Bay ATF); and a newly excavated channel for dredged material delivery from the SF-10 area to a landside transfer basin on the BMKV site (Alternative 4: Direct Channel to BMKV Basin). The proposed action is

[1]The HWRP project includes the original 950-acre HWRP project site (Hamilton Army Airfield, Navy Ballfields, and the State Lands Parcel) and the 1,576-acre Bel Marin Keys Unit V (BMKV) expansion of the HWRP project. Now that the BMKV expansion of the HWRP has been Congressionally approved, there is only one HWRP "project," which encompasses a total of 2,526 acres. This document only refers to the HWRP as a single project and site. Where reference is made to the physical area of the BMKV portion of the HWRP, it is noted as "BMKV site".
[2] The term *project* as used in this SEIS/EIR refers explicitly to the term as defined under the CEQ's NEPA regulations and the State CEQA Guidelines: "the entirety of an action which has a potential for resulting in a physical change in the environment." The terms "proposed action" and "proposed project" are used interchangeably in this document. Both terms are used when identifying the project in general terms, and not as a specific alternative.
[3] SF-10 is an existing in-Bay dredged material disposal site located approximately 3 miles northeast of Point San Pedro in San Pablo Bay.
[4] A scow is a large flat-bottomed boat with broad square ends used chiefly for transporting bulk material.

Alternative 2: Unconfined In-Bay ATF; this alternative is also proposed as the environmentally preferred alternative. See Figures 1-1 and 1-2 for the proposed ATF and alternatives' features.

USACE and Conservancy have prepared this SEIS/EIR in accordance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The SEIS/EIR identifies and analyzes potential impacts associated with multiple alternatives. The alternatives are based on project objectives, USACE and Conservancy policy, and implementation of the local, regional, and national planning efforts listed below.

- Hamilton Wetland Restoration Project (including the Bel Marin Keys Unit V Expansion)
- Oakland Harbor Navigation Improvement (50-Foot) Project
- Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region
- Comprehensive Conservation and Management Plan
- San Francisco Bay Plan
- Ecosystem Restoration Program Plan
- San Francisco Bay Area Wetlands Ecosystem Goals Project
- The Marin Countywide Plan

These plans and programs are described in Chapter 1, *Purpose and Need*.

ES.1.1 Project Area

This SEIS/EIR will focus primarily on San Pablo Bay, with a particular emphasis on central and western parts of the Bay which may be affected by the proposed action and alternatives. The project area includes open water where the authorized use of an off-loader (Alternative 1: No Action) or alternative In-Bay ATF sites (Alternatives 2–3) would be located; the shallow bay and mudflat area between SF-10 and the restoration site where the dredged material transfer pipeline (Alternatives 1-3) and/or direct channel (Alternative 4) may be aligned; and the 60-acre ([ac] 24.2-hectare [ha]) portion of the BMKV site where a landward basin may be excavated (Alternative 4). Chapter 3, *Affected Environment*, provides a detailed description of the affected environment in the proposed project area.

ES.1.2 Relationship to the Hamilton Wetland Restoration Project

The HWRP is in an unincorporated area southeast of Novato, in Marin County, California. The HWRP and BMKV sites historically supported tidal salt marsh habitat, but levee construction around 1900 separated the area from the tidal influence of San Pablo Bay. Both sites have since been used for agriculture. On the HWRP site, 644 ac (about 261 ha) were converted for use as a military airfield in the 1930s. The BMKV site has remained agricultural and currently supports hay production.

As described in the 1998 HWRP EIS/EIR and 2003 BMKV SEIS/EIR, the authorized means of transporting dredged material to the HWRP is via a hydraulic off-loader in San Pablo Bay that pumps the dredged material to the site through a submerged pipeline. Independent review, workshops with national experts, and a value engineering (VE) study[5] that considered environmental, economic, and operational effects determined that a more efficient and flexible method of transferring dredged material should be evaluated. Therefore, this SEIS/EIR evaluates alternative methods for transfer of dredged material to the HWRP.

ES.1.3 Role of Lead Agencies

USACE and Conservancy, with support from the Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region (LTMS) agencies, are proposing a dredged material transfer facility to be used in restoring tidal wetlands at the HWRP site. USACE and Conservancy serve as the federal and state lead agencies, respectively, for this draft SEIS/EIR.

ES.2 Purpose and Need and Project Objectives

ES.2.1 Project Need

Alternative 1: No Action, was established as a means to transport dredged material from San Francisco Bay dredging projects for beneficial use at the HWRP site. Restoration of tidal wetlands on subsided diked baylands using dredged material provides an opportunity to offset historic wetland habitat loss and beneficially use suitable dredged material, rather than disposing it at in-Bay or ocean disposal sites.

As described VE study conducted by USACE for the HWRP, identified restrictions related to construction and operation costs, operational flexibility, and efficiency of dredged material transport for beneficial use at the HWRP site.

Specifically, the proposed ATF could accommodate most San Francisco Bay dredging projects with clean suitable material, rather than only those projects with dredged material transport vessels equipped to utilize the off-loader as under Alternative 1. Additionally, the proposed ATF would be available to receive dredged sediment all year. Thus, the proposed ATF would maximize the operational flexibility of the HWRP project to accommodate dredged material from both large and small dredging projects, as well as maximize the potential for beneficial use of dredged material at the HWRP site. The proposed ATF would significantly reduce standby time and costs. Furthermore, it would eliminate scheduling conflicts that result when delivery vessels are forced to queue because the off-loader only allows for one vessel to moor alongside and unload dredged material at any one time. This would prevent delays to operations at the HWRP site, as dredged material placement activities and subsequent transfer and beneficial use could occur independently.

ES.2.2 Project Purpose and Objectives

The purpose of the proposed ATF is to maximize efficiency of the dredged material use operation by providing operational flexibility and cost efficiency during transfer of dredged material to the HWRP site. This will enable restoration construction in nearly half the time as the authorized off-loader

[5] A VE study is an analysis of materials, processes, and products in which functions are related to costs. A VE study allows for a project to be defined or redefined such that the project achieves the desired function within the performance guidelines at the lowest overall cost.

facility (from approximately 18 years to 10 years), thereby facilitating wetland habitat restoration benefits in the San Francisco Bay area.

Project objectives include the following:

- Offer operational flexibility for the type and size of dredged material transport vessels that could deliver material for beneficial use at the HWRP site;
- Using more potential sources of dredged material and the capability to stockpile dredged material for future beneficial use at the HWRP when the site is not actively accepting material (rather than disposing of dredged material at in-Bay and ocean sites);
- Provide a reliable, cost effective means of transporting dredged material to the HWRP site; and
- Facilitate implementation of the LTMS through beneficial use of dredged material.

ES.3 Alternatives

USACE and Conservancy are considering the following alternatives for dredged material transport in this document.

- **Alternative 1: Authorized Dredged Material Off-Loader (No Action)**
- **Alternative 2: Unconfined In-Bay ATF (Proposed Action)**
- **Alternative 3: Confined In-Bay ATF**
- **Alternative 4: Direct Channel to BMKV Basin**

Because the off-loader was the approach considered and adopted in the HWRP EIS/EIR (USACE 1998) and BMKV SEIS/EIR (USACE 2003), it is considered to be the No Action alternative for the purposes of this SEIS/EIR.

ES.3.1 Alternative 1: Dredged Material Off-Loader (No Action)

Under Alternative 1, the dredged material off-loader facility would be used as described in the HWRP EIS/EIR and BMKV SEIS/EIR. Transport scows would be used to move material from the locations where dredging is taking place to the off-loading facility in San Pablo Bay. An existing off-loading facility for the Port of Oakland -50-foot dredging project is currently located approximately 28,000 feet offshore from the HWRP site at approximately the -24 to -28-foot mean lower low water (MLLW) contour to enable large scows (5,000 cubic yard [cy] capacity) to moor and off-load. This alternative would include continued use of the existing off-loading facility or construction and use of a similar facility at the same location. Additionally, any future off-loading facility could be replaced during the life of the project.

Alternative 1, consisting of the authorized off-loader facility and support barges, would have approximated outside dimensions of 1,000 feet by 300 feet. While the facility would be approximately 1,000 feet long, it would only be up to 300 feet wide in a small portion, but most of the facility would be 75 feet wide. Equipment on the off-loading facility would include a hydraulic off-loader, attendant equipment and tool barge, three mooring barges, a cable reel barge, and a booster pump(s) on barges. The total overwater footprint of the off-loader facility, attendant barge, mooring platform and booster pumps would be 2.3 ac, and the footprint of the pipeline and related facilities would be approximately 2.2 ac. Alternative 1 would be designed to accommodate two dump scows moored simultaneously, with one dump scow being unloaded at any given time. Table 2-3 (in Chapter 2, *Description of Alternatives*) provides a comparison of Alternative 1 to the other three alternatives.

Construction of HWRP via Alternative 1 would take an estimated 18 years to complete, including receipt and transfer of approximately 1.2 million cubic yards (mcy) annually from dredging projects. The maximum annual capacity under this alternative is estimated to be 1.5 mcy, but due to operational constraints, it is not expected to average this amount.

ES.3.2 Alternative 2: Unconfined In-Bay ATF (Proposed Action)

As described above, Alternative 2: Unconfined In-Bay ATF is the proposed action considered in this draft SEIS/EIR. Under Alternative 2, the proposed ATF would be located in San Pablo Bay near SF-10. Dredge delivery vessels (scows and hopper dredges) would deposit material dredged from San Francisco Bay into the proposed ATF basin. Material placed in the ATF basin would then be re-dredged using a hydraulic cutterhead dredge and pumped to the HWRP site through a transfer pipeline. Similar to the authorized off-loader facility (under Alternative 1), the proposed ATF would be located approximately 26,000 to 28,000 feet from the HWRP site at approximately the -24 to -28-foot MLLW contour. However, unlike the authorized off-loader facility, Alternative 2 would allow large scows (5,000 cy capacity) and hopper dredges (up to 6,000 cy capacity) to more efficiently place dredged material in the submerged basin, without the need to moor alongside and off-load material as under Alternative 1.

The ATF basin would measure approximately 1,000 feet by 1,500 feet, with a total active footprint of approximately 34 acres. The basin would be excavated to a depth of approximately -45 to -60 feet MLLW with assumed 1V:4H side slopes (1 foot vertical to 4 foot horizontal);in-active footprint of the side-slope area would be about 24 acres, bringing the total footprint of the basin to 58 acres. This approach would provide for a minimum deposition thickness of 18 feet, and a maximum filled design depth of -27 feet MLLW for dumping a fully loaded hopper dredge.

Assuming the ATF basin were located in an area where water depth is less than -32 feet MLLW, construction of an access channel would be required to allow access for fully loaded haul scows and hopper dredges to the in-Bay ATF basin. Annual channel maintenance dredging may also be required depending on the location of the basin to allow uninterrupted passage of loaded vessels. Material excavated from the basin and the access channel would be transferred for beneficial use at the HWRP site - if the transferred dredged materials are at or below contaminant concentrations outlined by the U.S. Fish and Wildlife Service (USFWS) and Regional Water Quality Control Board (RWQCB) permits for the HWRP. Table 2-3 (in Chapter 2, *Description of Alternatives*) provides a comparison of Alternative 2 to the other three alternatives.

Alternative 2 would take an estimated 10 years, and approximately 1.6 mcy of dredge material from dredging projects annually. With the addition of 400,000 cy of dredged material from basin infill and access channel maintenance, approximately 2.0 mcy of dredged material would be generated under the proposed ATF and transferred to the HWRP site for beneficial use. Because the total capacity of the proposed ATF basin at any one time is expected to be less than 1.6 mcy, it is anticipated that the basin would be emptied more than once per year; specifically, the USACE is anticipating a 6-month placement window. Considering this basin limit, the maximum operational capacity of this alternative is estimated to be approximately 4.0 mcy; if this alternative were to operate at that maximum capacity, then approximately 3.6 mcy of dredged material would be received and transferred to the HWRP site, with about 400,000 cy of the dredged material being sourced from basin infill and access channel maintenance dredging.

ES.3.3 Alternative 3: Confined In-Bay ATF

Alternative 3: Confined In-Bay ATF, would be similar to Alternative 2, except that the proposed ATF basin would incorporate a structural enclosure to isolate dredged material from surrounding waters. The enclosure would be constructed with a sheet pile wall installed along its perimeter to create a confined basin. Approximately 4,300 lineal feet of steel sheet piles would be erected around the confined ATF, with two 500-foot-wide openings provided for vessel access that are offset to minimize currents through the facility. The top 10 feet of the enclosure surrounding the confined ATF would be visible at high tide (approximate elevation +18 MLLW); the top 18 feet of the enclosure would be visible at low tide. The sheet pile structure would be inspected regularly to monitor its structural stability. The inspection would include survey of the structure to ensure no significant displacement has occurred, examination and replacement of cathodic protection, and assessment of the perimeter for scour or shoaling adjacent to sheet piles. The dimensions of the proposed ATF basin under this alternative would be the same as under Alternative 2. Similar to the proposed action, Alternative 3 would take an estimated 10 years to complete, receive, and transfer the same volumes of dredged material, and would also have the same maximum operational capacity of approximately 4.0 mcy. Specifically, the USACE is anticipating a 6-month placement window. Table 2-3 (in Chapter 2, *Description of Alternatives*) provides a comparison of Alternative 3 to the other three alternatives.

ES.3.4 Alternative 4: Direct Channel to BMKV Basin

Alternative 4 involves dredging a direct channel across existing outboard marshes from the vicinity of SF-10 to the BMKV site. Under this alternative, dredged material transport vessels would travel from their respective dredging source areas in San Francisco Bay to the BMKV site using the direct channel and transfer dredged materials into a newly constructed basin at the BMKV site for beneficial use at the HWRP. The direct channel would begin near the existing SF-10 in-Bay disposal site because the site is located on the main shipping channel in San Pablo Bay and provides an appropriate depth for access by delivery vessels.

The direct channel would be constructed to be approximately 22,300 feet long by180 feet wide, with assumed 1V:4H side slopes (1 foot vertical to 4 feet horizontal). The direct channel would be excavated to a depth of -17 feet MLLW (including design over-depth dredging) and have an initial total footprint area of 123 ac. Over time, it is expected that the channel’s side slopes would slump to 1V:15H, resulting in a total footprint area of 243 ac. The ultimate width of the direct channel is estimated to be approximately 900 feet after channel slumping. Construction of the direct channel would involve dredging approximately 2.0 mcy of material from San Pablo Bay. The direct channel would require annual maintenance dredging of approximately 424,000 cy of material. Similar to Alternatives 2 and 3, material dredged from the direct channel would be used at the HWRP site if it meets the USFWS and RWQCB permitted dredged material quality requirements for HWRP (see Table 2-4).

Alternative 4 would provide for one-way traffic within the direct channel. Total one-way travel distance beyond the proposed ATF basin site would be 6.1 nautical miles; the total round trip transit/placement time would be approximately 2.4 hours. Transport vessels would be limited to large scows with 5,000 cy of capacity, or smaller vessels due to channel depth and vessel draft; the hopper dredges would not be used with this alternative. Additionally, the large scows could only be half-loaded during certain periods of the tidal cycle to a design draft of 12 feet.

Under Alternative 4, dredged material would be deposited in the excavated BMKV basin. Similar to the proposed ATF basin under Alternatives 2 and 3, the BMKV basin would measure approximately 1,000 feet by 1,500 feet, with a total active footprint of approximately 34 acres. However, the BMKV basin would be excavated to a depth of -27 to -32.5 feet MLLW with 1V:3H side slopes covering an in-active footprint of 10 acres for a total footprint of 44 acres for the basin. In addition to transfer and beneficial use at the HWRP, material excavated from the basin would be used to construct a 13-foot high perimeter levee around the BMKV basin to isolate it from the remainder of the HWRP site This perimeter levee would cover an approximate area of 16 acres, with a total disturbance footprint of 60 acres for both the BMKV basin and levee. The existing outboard levee would be breached to allow tidal access between the BMKV basin and the direct channel, with the perimeter levee surrounding the basin limiting tidal exchange to the basin itself, as described above.

Alternative 4 would take an estimated 9 years to complete and would have a maximum basin capacity of approximately 1.6 mcy. Approximately 440,000 cy of additional basin infill and access channel maintenance dredging material would be generated, for a total maximum of approximately 2.1 mcy that could be transferred to the HWRP site for beneficial use. Because the total capacity of the BMKV basin at any one time is expected to be less than 1.7 mcy, the basin is expected to be emptied more than once per year; specifically, the USACE is anticipating a 6-month placement window. Considering this basin limit, the maximum operational capacity of this alternative is estimated to be approximately 4.0 mcy; if this alternative were to operate at that maximum capacity, then approximately 3.6 mcy of dredged material would be received and transferred to the HWRP site, with 440,000 cy of the dredged material being sourced from basin infill and direct channel maintenance dredging.

Table 2-3 (in Chapter 2, *Description of Alternatives*) provides a comparison of Alternative 4 to the other three alternatives.

ES.3.4.1 Identifying the Preferred Alternative

According to NEPA, an EIS must rigorously explore and evaluate a reasonable range of alternatives to the project that would attain the basic project objectives. According to CEQA, an EIR must similarly evaluate a reasonable range of feasible alternatives that could attain most of the basic project objectives; in addition, alternatives must avoid or substantially lessen any of the significant environmental impacts of the project. To meet these requirements, the selected alternatives were screened for technical, economic, and environmental feasibility to determine whether they were viable alternatives that can be evaluated under NEPA and CEQA.

Specific criteria were developed to screen the five potential alternatives in the following three categories, and are described in more detail in Chapter 2, *Description of Alternatives*.

- **Project Objectives—**achievement of the project purpose and need and basic project objectives;
- **Implementation Feasibility—**financial, technical, and logistical feasibility; and
- **Environmental Impacts—**effects on the physical, biological, and social components of the ecosystem.

ES.3.4.2 Preferred Alternative

Alternative 2: Unconfined In-Bay ATF, meets the project's purpose and need and objectives, is feasible for implementation, and will reduce some of the environmental impacts of the tier 1 alternatives. Alternative 2 is proposed as the preferred alternative in this SEIS/EIR.

ES.3.4.3 Benefits of the Preferred Alternative

The benefits of the preferred alternative include the following:

- Receipt of dredged material at an expanded and faster rate, and the capability to stockpile dredged material for future beneficial use at the HWRP site when it is not actively accepting material (rather than disposing of dredged material at in-Bay or ocean disposal sites);
- Offer operational flexibility for the type and size of dredged material transport vessels that could deliver material for beneficial use at the HWRP site;
- Facilitate implementation of the HWRP, as well as the LTMS.

ES.3.4.4 Impacts of the Preferred Alternative

This draft SEIS/EIR evaluated a total of 68 environmental impacts. For the proposed action (Alternative 2), 20 impacts were identified as significant or potentially significant impacts. Feasible mitigation is available to reduce all but one of the proposed project's significant effects to a less-than-significant level.

ES.4 Impacts and Mitigation of the Proposed Alternatives

A list of specific resource topics was developed to focus on and compare environmental impacts of the proposed action and alternatives. The list was drafted based on applicable laws, regulations and policies, as well as comments from USACE, Conservancy, and BCDC staff, the interested and affected public, and other agencies that were contacted during scoping. Chapter 3, *Affected Environment*, describes the existing environment that could be affected by the proposed action and alternatives. The existing conditions as described establish the baseline for the analysis of effects. Chapter 4, *Environmental Consequences*, provides a detailed analysis and discussion of the probable environmental consequences, or impacts, of implementing the proposed action and alternatives.

A summary of the impact analysis for all alternatives is presented at the end of this chapter (see Table ES-1). In addition, CEQA and NEPA require a review of other issues, which are summarized below.

ES.4.1 Significant Unavoidable Effects

There are several significant impacts that proposed mitigation may not mitigate to a less-than-significant level with implementation of the proposed action or alternatives. These significant and unavoidable impacts are listed below and identified in the respective resource sections in Chapter 4, *Environmental Consequences*, are listed below.

- Impact MTB-1: Entrainment (of green and white Sturgeon) in Dredge Equipment during Construction Excavation, Maintenance Dredging, and Operational Dredged Material Removal (Alternatives 2, 3, and 4).
- Impact MTB-3: Injury or Mortality (to green sturgeon, salmonids, groundfish, mid-water fish and benthic organisms) from Propeller Strikes, Vessel Collision, and/or Entrainment in Prop Wash during Construction, Maintenance, Operation, and Decommissioning (Alternative 4).
- Impact MTB-4: Impacts to Aquatic Organisms (green sturgeon, salmonids, groundfish, and mid-water fish) Resulting from Contact with Resuspended Sediment Plumes (Alternative 4).
- Impact MTB-6: Impacts to Aquatic Organisms (green sturgeon, salmonids, groundfish, mid-water fish, and marine mammals) resulting from Pile-Driving Generated Noise (Alternative 3).
- Impact MB-7: Loss of Intertidal, Mudflat, and Marsh Habitats and Associated Foraging, Spawning, Rearing, and Migration Habitats (Alternative 4).
- Impact MTB-13: Temporary Loss (9–18 Years) of Foraging Habitat for Shorebirds, California Clapper Rail, and California Black Rail during Construction, Maintenance, Operation, and Decommissioning (Alternative 4).
- Impact MTB-15: Disturbance to Bird Species due to Project-Related Noise (Alternative 4).
- Impact MTB-16: Short-term (9–18 Years) Loss and/or Degradation of Tidal Mudflat Habitat during Construction, Maintenance, Operation, and Decommissioning (Alternative 4).
- Impact LU-1: Consistency with Applicable County and City General Plan Policies (Alternative 4).
- Impact LU-2: Consistency with the San Francisco Bay Plan and/or LTMS Management Plan (Alternative 4).
- Impact TMN-1: Safety Hazard to Boaters and Disruption to Vessel Traffic (Alternative 3).

ES.4.2 Irreversible and Irretrievable Commitment of Resources

Pursuant to NEPA (40 Code of Federal Regulations [CFR] 1502.16) and CEQA Guidelines (Section 15126.2(c)), an EIS/EIR shall discuss a project's irreversible environmental changes associated with usage of nonrenewable resources during its construction and long-term operation. This section also requires a discussion of the proposed project's irreversible changes related to potential environmental accidents.

The proposed project would result in the irretrievable commitment of fossil fuels and other energy sources to build, operate, and maintain the proposed ATF or alternatives for the project timeframe

(9-18 years). Activities associated with the project would consume petroleum products used to power many construction-related vehicles and pieces of machinery. Many of the materials used for off-loader structure, transfer pipeline, and booster pump stations would also be non-renewable. Upon project completion, additional consumption of resources would not continue.

Impact TMN-1 Navigation Hazard in Section 4.11, *Transportation and Marine Navigation*, mentions the rare and unlikely event of a major oil spill as a result of a collision with the sheet pile enclosure in Alternative 3. Although unlikely, were this to occur, there could be long-term and irreversible adverse effects to biological resources (i.e., green sturgeon) and other resources in San Pablo Bay and other parts of greater San Francisco Bay. As previously discussed, the LTMS agencies are conducting green sturgeon tagging studies to develop an understanding of the spatial and temporal distribution and movement of green sturgeon in San Francisco Bay, including installation of acoustic monitors in the general area of the ATF basin to record any potential effects on green sturgeon. Should the tagging studies indicate that green sturgeon are attracted to the site, USACE will develop measures in consultation with NOAA Fisheries to further reduce any potential entrainment impacts on green sturgeon.

ES.4.3 Cumulative Impacts

The HWRP and proposed ATF or alternatives, combined with the construction of other regional wetlands projects (Sonoma Baylands, Sears Point, Montezuma, Tolay Creek, Cullinan Ranch, and Napa River Salt Marsh) would result in the following cumulative beneficial impacts:

- restored wetlands habitat to support special status plant, fish and wildlife species (all alternatives);
- an increase in San Francisco Bay's tidal prism (all alternatives);
- an expanded and faster overall completion of restoration in San Francisco Bay (Alternatives 2, 3, and 4);
- reduce aquatic disposal of dredged sediment at four in-Bay and one deep ocean disposal sites (all alternatives), and
- meeting the goals of the LTMS, and other federal, state, and regional wetlands habitat conservation programs (all alternatives).

The proposed ATF or alternatives combined with the construction of the regional wetlands projects and other in-Bay construction projects (such as the TransBay Cable) may result in several cumulatively considerable and unavoidable adverse impacts which include:

- alteration to San Pablo Bay sediment budget through redirection of material from in-Bay disposal given the erosive nature of San Pablo Bay at present (all alternatives);
- entrainment of green and white sturgeon resulting from construction, maintenance, and/or operational dredging (Alternatives 2, 3, and 4);
- entrainment of other special status and/or common fish species resulting from construction, maintenance, and/or operational dredging (Alternative 4);
- mortality and/or loss if special status and/or common fish species due to engine propeller strikes (Alternative 4);

- temporary loss and/or degradation of up to 243 ac of subtidal and tidal mudflat habitat (Alternative 4);
- mortality and/or harassment of listed fish and marine mammals immediately adjacent to pile driving activities (Alternative 3);
- consistency with applicable county, city, and regional plans and policies (Alternative 4); and
- creation of a safety hazard to boaters and disruption of vessel traffic in San Pablo Bay (Alternative 3).

For a detailed discussion of cumulative impacts, see Chapter 5, *Other Required Analysis*.

ES.4.4 Growth Inducing Impacts

Because construction and operation of the proposed ATF or alternatives would not generate a substantial number of new jobs, directly or indirectly induce major or significant development, or result in local or regional economic growth.

ES.4.5 Relationship between Short-Term Uses of the Environment and Long-Term Productivity

Pursuant to NEPA (40 CFR 1502.16), an EIS must consider the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity.

Under past practices, the majority of Bay Area dredged material was being managed as waste to be disposed. The proposed action enables a shift – consistent with the LTMS Management Plan – from short-term, project-specific uses of the environment (i.e., dispersive aquatic disposal) to a long-term, beneficial use of dredged material that would provide for environmental restoration. Due to the nature of the project itself – a dredged material transfer facility for beneficial use in tidal wetlands restoration – implementation of either Alternative 1: No Action or any one of the three action alternatives would result in a long-term increase in beneficial use of dredged material.

Short-term uses of the environment that would occur under the proposed ATF or alternatives include impacts to marine mammals, fish, and seabird species, along with temporary (9 – 18 years) loss of tidal mudflat habitat, from construction-related activities. Additionally, transfer of dredged material for beneficial use would also generate short-term impacts including vessel traffic, changes in tidal flows, turbidity, noise, and air pollutant emissions associated with construction and operation of the rehandling facility.

However, in the long term, implementation of the proposed action would facilitate the restoration of tidal wetlands at the HWRP, which is expected to be substantially more productive site for both marine and terrestrial habitat and wildlife values. The long-term productivity of the restoration site – facilitated by the proposed action – will support habitat for marsh-dependant birds and fish, contribute to water filtration, accommodate flood flows from adjacent uplands, and provide recreational opportunities for Bay Area residents.

ES.4.6 Environmentally Preferable Alternative

NEPA requires identification of the environmentally preferable alternative. CEQA similarly requires identification of the environmentally superior alternative. For the purposes of this document, the term "environmentally preferable alternative" is used in place of "environmentally superior alternative."

Alternative 2, the proposed action, is considered environmentally preferred to the authorized off-loader alternative (Alternative 1: No Action) for the following reasons:

- Timing - Construction of the HWRP will be completed in 10 years with Alternative 2, compared to 18 years with the authorized off-loader. Faster completion of the HWRP will bring the benefits of restored tidal and other wetlands habitats to fruition sooner, resulting in benefits to threatened and endangered species, including the California clapper rail, the Salt marsh harvest mouse, and steelhead, as well as to many other rare and common species.
- Air Quality – Project emissions controls would constrain any of the alternatives to less than the conformity threshold for NOx emissions, compared to Alternative 1: No Action. However, the timeframe for completion of the project under Alternative 2 would avoid 8 years of additional emissions that would occur under Alternative 1.
- Reduction in Processed Water used for Dredged Material Transfer – The authorized off-loader under Alternative 1 would use large amounts of water to flush the transfer pipeline each time dredged material is pumped from the dredge scow for transfer to the HWRP site; the flushing is needed to keep the transfer pipeline open and operational. Under Alternative 2, dredging of the ATF basin and transfer to the HWRP site would not require flushing each time the ATF basin were emptied; thus, far less amounts of water would be placed on the HWRP site.
- Beneficial Reuse of Dredged Material Annually – Due to operational capacity limitations, the authorized off-loader would only accommodate an average of 1.2 mcy of dredged material each year with an approximate maximum operational capacity of 1.5 mcy. Alternative 2 would transfer an average of approximately 1.6 mcy annually but could transfer as much as 3.6 mcy in a year, which would allow for a greater amount of annual beneficial reuse of dredged materials in San Francisco Bay. This increase would further the goals of the LTMS at a greater level compared to Alternative 1: No Action. Further, at least 400,000 cy of maintenance dredged material would be disposed in San Francisco or San Pablo Bays, or at ocean disposal sites under Alternative 1 in comparison to Alternative 2. Use of the ATF site would eliminate in-Bay or ocean disposal impacts at multiple sites that could not be avoided under Alternative 1.

Alternative 2 is considered environmentally preferred to Alternative 3 for the following reasons:

- Impacts to Special-Status Species – Alternative 3 would require pile-driving of sheet pile, which would result in significant and unavoidable impacts to marine mammals and fish species, including green sturgeon, whereas Alternative 2 would not have sheet pile.
- Navigational Safety – Alternative 2 creates fewer hazards to navigation in San Pablo Bay as it includes no above-water or below-water structures. Alternative 3 creates a significant and unavoidable impact to navigational safety as it would create a nearly 58 acre structural enclosure adjacent to the main shipping channel. While marking and aids to navigation can help to manage navigational safety, such a large structure could be a hazard, particularly in the event of large vessel movement (e.g., an oil tanker) during visually impaired conditions (like fog), or if such a vessel were to experience power loss.

Alternative 2 is considered environmentally preferred to Alternative 4 for the following reasons:

- Disturbance of San Pablo Bay Habitats and Special-Status Species – Alternative 2 would have far less impact to aquatic habitats compared to Alternative 4; Alternative 4 would require extensive disturbance due to excavation, maintenance, and operation of a 22,300-foot direct channel through both subtidal and tidal habitats. Alternative 4 would also result in significant and unavoidable impacts to green sturgeon and other special-status species due to the excavation, maintenance, and operation of the direct channel, whereas Alternative 2 has a considerably smaller access channel in comparison.

While each alternative has certain environmentally beneficial features, when the overall environmental benefits and adverse impacts of all alternatives are compared together, Alternative 2 would be considered the environmentally preferred alternative for the reasons noted above.

In addition to its environmental benefits, there are also substantial economic and operational benefits of Alternative 2 in comparison to the other alternatives; therefore, Alternative 2 is the proposed preferred alternative in this SEIS/EIR.

ES.5 Plans and Policy Consistency

An evaluation of the proposed action and alternatives' consistency with federal, state and regional plans and policies is presented in Table 4.8-2 in Section 4.8, *Land Use*, of the SEIS/EIR. Compared to Alternative 1, the proposed action would allow for the goals of the LTMS to be further realized by reducing in-Bay or ocean disposal by an additional 1.0 mcy per year and reducing the amount of time required to restore wetlands at the HWRP site (from 18 to 10 years). In addition, reducing the effects of in-Bay or ocean disposal on aquatic organisms and restoring approximately 2,526 acres at the HWRP would meet the goals of the *San Francisco Estuary Project* (SFEP), the *San Francisco Bay Plan*, California Bay Delta Program's *Ecosystem Restoration Program Pla*n, and the *San Francisco Bay Area Wetlands Ecosystem Goals Project*, which are described in Chapter 1, *Purpose and Need*.

ES.6 Issues of Concern Raised during Scoping

During the planning process, the lead agencies held a public meeting to introduce the proposed project to interested members of the public and solicit public input. The public meeting was held on January 26, 2005. Public comments received at this meeting were recorded for consideration during the planning process. In addition, participants were encouraged to submit written comments to USACE and Conservancy during the public comment period. The scoping process and other consultations undertaken for the proposed project are discussed in Chapter 6, *Scoping, Consultations, and Other Requirements*. The Scoping Summary Report is included as Appendix H to this SEIS/EIR.

Key issues of public concern that were raised during the scoping process include the following:

- Noise generation from the transfer facility operations (impacts on both humans and fish)
- Potential for navigation safety issues, especially oil tanker movement through San Pablo Bay
- Potential for odor, toxicity (heavy metals such as mercury), or air quality threat from the dredged material

- Timeline for creation of tidal wetlands, based on operation of the various alternatives
- Water circulation and sediment transport/siltation (increased turbidity) within San Pablo Bay
- Entrainment of aquatic organisms during slurry of dredged material, and potential impacts of slurry pipeline to species that move along the bottom
- Impacts on commercial and recreational fishing
- Operational impacts (air quality, traffic, noise) from increased large vessel, truck, and train traffic, and other port equipment
- Potential for removal of materials from San Pablo Bay floor to uncover ordnance and/or associated contaminants from Hamilton AFB activities
- Loss of biodiversity, impacts on special-status species and sensitive natural communities, interference with the movement of biotic or terrestrial wildlife, and potential disturbance to bird nesting, rearing, and fledgling activities
- Spread of nonnative invasive species that might be contained in dredged material
- Risk of failure of the confining structure (including emergency response measures)
- Visibility of the transfer facility

Of the public issues raised to date, several may be identified as controversial by certain parties. Those areas of controversy that do not relate to the evaluation of significant effects on the human and physical environment are not within the statutory purview of NEPA and CEQA, and would therefore not be addressed in this SEIS/EIR, but as described above, are recorded and included as part of the record.

ES.7 Public Review Process

The lead agencies will submit a Notice of Availability (NOA) to the Federal Register and a Notice of Completion (NOC) to the California State Clearinghouse and interested parties announcing the availability of this draft SEIS/EIR for a 45-day public review and comment period. The public review and comment period will be held from October 17, 2008 through December 1, 2008. During this period, state and federal regulatory agencies, local government agencies, and members of the public are encouraged to review the draft SEIS/EIR and submit comments on the document to the lead agencies.

Additionally, the lead agencies will hold a public meeting on November 12, 2008 at the USACE Bay Model Visitor Center in Sausalito, CA, to solicit any verbal comments on the draft SEIS/EIR.

512 **Table ES-1.** Summary of Impacts and Mitigation Measures

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
4.2 GEOLOGY AND SEISMICITY				
Impact GSS-1: Substantial Adverse Effects Resulting from Fault Rupture	No Impact.	No Impact	No Impact	No Impact
Impact GSS-2: Substantial Adverse Effects Resulting from Strong Seismic Ground Shaking	Less than Significant.	Less than Significant.	Less than Significant.	Less than Significant.
Impact GSS-3: Substantial Adverse Effects Resulting from Earthquake-Induced Liquefaction	Less than Significant.	Less than Significant.	Less than Significant.	Less than Significant.
Impact GSS-4: Substantial Adverse Effects Resulting from Unstable Geologic Units (Compressible Bay Mud Deposits)	Less than Significant.	Less than Significant.	Less than Significant.	Less than significant
4.3 CIRCULATION AND SEDIMENTATION				
Impact CS-1: Alteration of San Pablo Bay Circulation	Less than significant.	Less than significant.	Potentially significant.	Less than significant.
Impact CS-2: Resuspension, Sedimentation, and Erosion of In-Situ Sediments during and following Construction and Maintenance	Less than significant.	Less than significant.	Less than significant.	Less than significant.
Impact CS-3: Settling of Suspended Sediments during Operational and Decommissioning Placement of Dredged Material	Less than significant.	Less than significant.	Less than significant.	Less than significant.

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact CS-4: Alteration of San Pablo Bay and San Francisco Bay Sediment Budget from Redirection of Dredged Material	Less than significant.	Less than significant.	Less than significant.	Less than significant.
Impact CS-5: Compliance with the Goals of the San Francisco Bay LTMS	Beneficial	Beneficial	Beneficial	Beneficial
4.4 WATER AND SEDIMENT QUALITY				
Impact WSQ-1: Compliance with the Goals of the CCMP and San Francisco Bay LTMS	Beneficial	Beneficial	Beneficial	Beneficial
Impact WSQ-2: Potential to Increase Suspended Sediment Concentrations during Construction, Maintenance and Decommissioning	Less than significant	Less than significant with mitigation Mitigation Measure WSQ-MM-1: Implementation of Best Management Practices	Less than significant with mitigation Mitigation Measure WSQ-MM-1: Implementation of Best Management Practices	Less than significant with mitigation Mitigation Measure WSQ-MM-1: Implementation of Best Management Practices
Impact WSQ-MM-3: Potential to Increase Suspended Sediment Concentrations during Operation	Less than significant	Less than significant with mitigation <u>Mitigation Measure WSQ-MM-2:</u> Monitoring Dredged Material Placement Operations	Less than significant	Less than significant
Impact WSQ-4: Potential to Release Constituents of Concern during Construction, Maintenance, and Decommissioning	Less than significant	Less than significant with mitigation <u>Mitigation Measure WSQ-MM-3:</u> Preparation and Approval of a Sediment Sampling and Analysis Plan (SAP)	Less than significant with mitigation <u>Mitigation Measure WSQ-MM-3:</u> Preparation and Approval of a Sediment Sampling and Analysis Plan (SAP)	Less than significant with mitigation <u>Mitigation Measure WSQ-MM-3:</u> Preparation and Approval of a Sediment Sampling and Analysis Plan (SAP)

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact WSQ-5: Potential to Degrade Water Quality due to Increased Methylmercury Formation	Less than significant	Less than significant with mitigation Mitigation Measure WSQ-3: Preparation and Approval of a Sediment Sampling and Analysis Plan (SAP)	Less than significant with mitigation Mitigation Measure WSQ-MM-3: Preparation and Approval of a Sediment Sampling and Analysis Plan (SAP)	Less than significant with mitigation Mitigation Measure WSQ-MM-3: Preparation and Approval of a Sediment Sampling and Analysis Plan (SAP)
Impact WSQ-6: Potential to Release Contaminants during Operation	Less than significant	Less than significant	Less than significant	Less than significant
Impact WSQ-7: Potential to Reduce Dissolved Oxygen Levels	Less than significant	Less than significant	Less than significant	Less than significant
Impact WSQ-8: Potential to Impact Nutrient Loads	Less than significant	Less than significant	Less than significant	Less than significant
4.5 Marine and Terrestrial Biology				
Impact MTB-1: Entrainment in Dredge Equipment during Construction Excavation, Maintenance Dredging and Operational Dredged Material Removal.	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms Less than significant	Green and White Sturgeon: Significant and unavoidable Salmonids: Less than significant with mitigation Mitigation Measure MTB-MM-1: Constrain Construction Dredging and Placement of Maintenance Dredging Material in the ATF Basin to LTMS Environmental Work Groundfish, Mid-Water Fish, and Benthic Organisms: Less than significant	Green and White Sturgeon: Significant and unavoidable Salmonids: Less than significant with mitigation Mitigation Measure MTB-MM-1: Constrain Construction Dredging and Placement of Maintenance Dredging Material in the ATF Basin to LTMS Environmental Work Groundfish, Mid-Water Fish, and Benthic Organisms: Less than significant	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Significant and unavoidable

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact MTB-2: Entrainment and Burial of Green Sturgeon, Salmonids, Groundfish, and Mid-Water Fish Species in Descending Dredged Material Plume during Operational Dredged Material Placement	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant with mitigation	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant
Impact MTB-3: Injury or Mortality from Propeller Strikes, Vessel Collision, and/or Entrainment in Prop Wash during Construction, Maintenance, Operation, and Decommissioning.	Marine Mammals: No impact Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant with mitigation Mitigation Measure MTB-MM-2: Limitations on Construction and Operational Vessel	Marine Mammals: No impact Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant	Marine Mammals: No impact Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant	Marine Mammals: No impact Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Significant and unavoidable
Impact MTB-4: Impacts to Aquatic Organisms Resulting from Contact with Resuspended Sediment Plumes.	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish: Less than significant, Mitigation proposed Mitigation Measure MTB-MM-1: Constrain Construction Dredging and Placement of Maintenance Dredging Material in the ATF Basin to LTMS Environmental Work Benthic Organisms: Less than significant	Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant	Green Sturgeon, Salmonids, Groundfish, and Mid-Water Fish: Significant and unavoidable, Mitigation proposed Mitigation Measure MTB-MM-1: Constrain Construction Dredging and Placement of Maintenance Dredging Material in the ATF Basin to LTMS Environmental Work Benthic Organisms: Less than significant

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact MTB-5: Impact to Aquatic Organisms Resulting from Contact with and Bioaccumulation of Constituents of Concern Released during Construction, Maintenance, Operation, and Decommissioning	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant with mitigation Mitigation Measure MTB-MM-1: Constrain Construction Dredging and Placement of Maintenance Dredging Material in the ATF Basin to LTMS Environmental Work Mitigation Measure MTB-MM3: Coordinate with Appropriate Federal and State Agencies to Reduce Impact on Marine Mammals and Special-Status Fish Species during Pile-Driving Activities	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant with mitigation Mitigation Measure MTB-MM-1: Constrain Construction Dredging and Placement of Maintenance Dredging Material in the ATF Basin to LTMS Environmental Work Mitigation Measure MTB-MM3: Coordinate with Appropriate Federal and State Agencies to Reduce Impact on Marine Mammals and Special-Status Fish Species during Pile-Driving Activities	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant with mitigation Mitigation Measure MTB-MM3: Coordinate with Appropriate Federal and State Agencies to Reduce Impact on Marine Mammals and Special-Status Fish Species during Pile-Driving Activities
Impact MTB-6: Impacts to Aquatic Organisms Resulting from Pile-Driving Generated Noise	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Marine Mammals: Less than significant With Mitigation Mitigation Measure MTB-MM3: Coordinate with Appropriate Federal and State Agencies to Reduce Impact on Marine Mammals and Special-Status Fish Species during Pile-Driving Activities	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Marine Mammals: Less than significant With Mitigation Mitigation Measure MTB-MM3: Coordinate with Appropriate Federal and State Agencies to Reduce Impact on Marine Mammals and Special-Status Fish Species during Pile-Driving Activities	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Marine Mammals: Significant and Unavoidable Mitigation proposed Mitigation Measure MTB-MM3: Coordinate with Appropriate Federal and State Agencies to Reduce Impact on Marine Mammals and Special-Status Fish Species during Pile-Driving Activities	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Marine Mammals: No impact

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact MTB-7: Loss of Intertidal, Mudflat, and Marsh Habitats and Associated Foraging, Spawning, Rearing, and Migration Habitats	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Significant and unavoidable, Mitigation Proposed Mitigation Measure MTB-MM-1: Constrain Construction Dredging and Placement of Maintenance Dredging Material in the ATF Basin to LTMS Environmental Work
Impact MTB-8: Increased Predation on Aquatic Organisms	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant	Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms: Less than significant
Impact MTB-9: Impacts to Food Web	Less than significant	Less than significant	Less than significant	Less than significant
Impact MTB-10: Loss of Eelgrass Habitat	Less than significant	Less than significant	Less than significant	Less than significant
Impact MTB-11: Indirect Impacts to Aquatic Organisms from Accidental Petroleum Spills or Dredged Material Transfer Pipeline Leak	Less than significant	Less than significant	Less than significant	Less than significant
Impact MTB-12: Disturbance to Nesting Birds During Construction, Maintenance, Operation, and Decommissioning	No impact	No impact	No impact	Less than significant with mitigation. Mitigation Measure MTB-MM4: Conduct Surveys to Locate Migratory and Special Status Bird Nests, Including

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
				Northern Harrier, Burrowing owl and San Pablo Song Sparrow Nest Sites before Construction Is Initiated and Avoid Breeding Sites.
Impact MTB-13: Temporary Loss (9-18 Years) of Foraging Habitat for Shorebirds, California Clapper Rail, and California Black Rail During Construction, Maintenance, Operation and Decommissioning	Less than significant	Less than significant	Less than significant	Significant and unavoidable (Shorebirds only)
Impact MTB-14: Temporary Loss (9 – 18 Years) of Foraging Habitat for Upland Birds, Including the San Pablo Song Sparrow, Saltmarsh Common Yellowthroat, Burrowing Owl, and Northern Harrier during Construction, Maintenance, Operation, and Decommissioning	Less than significant	Less than significant	Less than significant	Less than significant
Impact MTB-15: Disturbance to Bird Species due to Project-Related Noise	Less than significant with mitigation Mitigation Measure MTB-MM5: Restrict Construction Activity within 250 ft of Tidal Marsh Habitat to the Non-Breeding Season	Less than significant with mitigation Mitigation Measure MTB-MM5: Restrict Construction Activity within 250 ft of Tidal Marsh Habitat to the Non-Breeding Season	Less than significant with mitigation Mitigation Measure MTB-MM5: Restrict Construction Activity within 250 ft of Tidal Marsh Habitat to the Non-Breeding Season	Significant and unavoidable. Mitigation proposed. Mitigation Measure MTB-MM4: Conduct Surveys to Locate Migratory and Special Status Bird Nests, Including Northern Harrier, Burrowing owl and San Pablo Song Sparrow Nest Sites before

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
				Construction Is Initiated and Avoid Breeding Sites.
Impact MTB-16: Short-term (9–18 Years) Loss and/or Degradation of Tidal Mudflat Habitat during Construction, Maintenance, Operation, and Decommissioning	Less than significant	Less than significant	Less than significant	Significant and unavoidable
Impact MTB-17: Short-term (9 – 18 Years) Loss and/or Degradation of Tidal Salt Marsh Habitat during Construction, Maintenance, Operation, and Decommissioning	No impact	No impact	No impact	No impact
Impact MTB-18: Loss of Special-Status Plant Species and/or Habitat for Special-Status Plant Species during Construction, Operation, Maintenance, and Decommissioning	No impact	No impact	No impact	No impact
Impact MTB-19: Short-term (9 –18 Years) Loss of Upland Habitats, Including Agricultural Land and Non-Tidal Wetlands	Less than significant	Less than significant	Less than significant	Less than significant
Impact MTB-20: Indirect Degradation of Tidal Mudflat and Tidal Salt Marsh Habitat Resulting from Uptake of Mercury by Vegetation due to Project Construction and	Less than significant	Less than significant	Less than significant	Less than significant

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Maintenance during Construction, Operation, Maintenance, and Decommissioning				
Impact MTB-21: Introduction or Spread of Noxious Weeds during Construction, Operations, Maintenance, and Decommissioning	Less than significant with mitigation Mitigation Measure MTB-MM6: Implement Measures to Avoid the Introduction and Spread of Invasive Plants	Less than significant with mitigation Mitigation Measure MTB-MM6: Implement Measures to Avoid the Introduction and Spread of Invasive Plants	Less than significant with mitigation Mitigation Measure MTB-MM6: Implement Measures to Avoid the Introduction and Spread of Invasive Plants	Less than significant with mitigation Mitigation Measure MTB-MM6: Implement Measures to Avoid the Introduction and Spread of Invasive Plants
Impact MTB-22: Compliance with the Goals of the CCMP and San Francisco Bay LTMS	Beneficial impact	Beneficial impact	Beneficial impact	Beneficial impact
4.6 Population, Housing and Environmental Justice				
Impact POP-1: Induce Substantial Population Growth	Less than Significant.	Less than Significant.	Less than Significant.	Less than Significant.
Impact POP-2: Displace People or Housing	No Impact.	No Impact.	No Impact.	No Impact.
Impact POP-3: Have Disproportionately High and Adverse Human or Environmental Effects on Disadvantaged Communities	Water Quality Less than Significant Air Quality Less than Significant Noise No Impact	Water Quality Less than Significant with Mitigation Mitigation Measure WSQ-MM-1: Implementation of Best Management Practices Mitigation Measure WSQ-MM-2: Monitoring Dredged Material Placement Operations Mitigation Measure WSQ-MM-3: Preparation and	Water Quality Less than Significant with Mitigation Mitigation Measure WSQ-MM-1: Implementation of Best Management Practices Mitigation Measure WSQ-MM-2: Monitoring Dredged Material Placement Operations Mitigation Measure WSQ-MM-3: Preparation and	Water Quality Less than Significant with Mitigation Mitigation Measure WSQ-MM-1: Implementation of Best Management Practices Mitigation Measure WSQ-MM-2: Monitoring Dredged Material Placement Operations Mitigation Measure WSQ-MM-3: Preparation and

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
		Approval of a Sediment Sampling and Analysis Plan (SAP) Air Quality Less than Significant Noise No Impact	Approval of a Sediment Sampling and Analysis Plan (SAP) Air Quality Less than Significant Noise No Impact	Approval of a Sediment Sampling and Analysis Plan (SAP) Air Quality Less than Significant Noise No Impact
4.7 Cultural Resources				
Impact CR-1: Direct or Indirect Impacts to an Archaeological or Historic Resource	No Impact.	Less than Significant with Mitigation. Mitigation Measure CR-MM-1: Initiate and Execute Section 106 Consultation and Evaluation Procedures for Review by SHPO.	Less than Significant with Mitigation. Mitigation Measure CR-MM-1: Initiate and Execute Section 106 Consultation and Evaluation Procedures for Review by SHPO.	Less than Significant with Mitigation Mitigation Measure CR-MM-1: Initiate and Execute Section 106 Consultation and Evaluation Procedures for Review by SHPO.
Impact CR-2: Direct or Indirect Destruction of a Unique Paleontological Resource or Site	Less than Significant.	Less than Significant.	Less than Significant	Less than Significant
4.8 Land Use				
Impact LU-1: Consistency with Applicable County and City General Plan Policies	No Impact.	Less than Significant.	Less than significant.	Significant and Unavoidable.
Impact LU-2: Consistency with the San Francisco Bay Plan and/or LTMS Management Plan	Less than Significant.	Less than Significant.	Less than significant.	Significant and Unavoidable.
Impact LU-3: Displacement of Existing Land Uses	No Impact.	No Impact.	No impact.	Less than Significant.

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact LU-4: Conflict with Existing Utilities and Utility Easements	Less than Significant.	Less than Significant.	Less than Significant.	Less than Significant.
Impact LU-5: Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to Non-Agricultural Use	No Impact.	No Impact.	No Impact.	Less than Significant.
4.9 Recreation and Fishing				
Impact RF-1: Recreational Fishing	Less than Significant.	Less than Significant.	Less than Significant.	Less than Significant.
Impact RF-2: Recreational Hunting	Less than Significant.	Less than Significant.	Less than Significant.	Less than Significant.
Impact RF-3: Other Water-Based Recreation	Less than Significant.	Less than Significant.	Less than Significant.	Less than Significant.
4.10 Petroleum and Hazardous Materials				
Impact PHM-1: Potential Public Health Hazard during Construction due to Exposure to Transport, Use, or Appropriate Disposal of Petroleum Products or Hazardous Materials	Less than Significant with Mitigation Mitigation Measure PHM-MM-1: Remediation of Unexploded Ordnance	Less than Significant with Mitigation Mitigation Measure PHM-MM-1: Remediation of Unexploded Ordnance	Less than Significant with Mitigation Mitigation Measure PHM-MM-1: Remediation of Unexploded Ordnance	Less than Significant.
Impact PHM-2: Potential Water and Sediment Quality Degradation due to Transport, Use, or Appropriate Disposal of Petroleum Products or Hazardous Materials during Disposal Activities	Less than Significant.	Less than Significant.	Less than Significant.	Less than Significant.

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
4.11 TRANSPORTATION AND MARINE NAVIGATION				
Impact TMN-1: Hazard and Safety to Boaters and Disruption to Vessel Traffic	Less than Significant with Mitigation Mitigation Measure TMN-MM-1: Follow U.S. Coast Guard Requirements Mitigation Measure TMN-MM-2: Coordination with the U.S. Coast Guard Vessel Traffic Service Mitigation Measure TMN-MM-3: Channel Navigation and Maneuverability	Less than Significant with Mitigation Mitigation Measure TMN-MM-1: Follow U.S. Coast Guard Requirements Mitigation Measure TMN-MM-2: Coordination with the U.S. Coast Guard Vessel Traffic Service Mitigation Measure TMN-MM-3: Channel Navigation and Maneuverability Mitigation Measure TMN-MM-4: Plans and Practices within the Proposed ATF	Significant and Unavoidable Mitigation Proposed Mitigation Measure TMN-MM-1: Follow U.S. Coast Guard Requirements Mitigation Measure TMN-MM-2: Coordination with the U.S. Coast Guard Vessel Traffic Service Mitigation Measure TMN-MM-3: Channel Navigation and Maneuverability Mitigation Measure TMN-MM-4: Plans and Practices within the Proposed ATF	Less than Significant with Mitigation Mitigation Measure TMN-MM-1: Follow U.S. Coast Guard Requirements Mitigation Measure TMN-MM-2: Coordination with the U.S. Coast Guard Vessel Traffic Service Mitigation Measure TMN-MM-3: Channel Navigation and Maneuverability Mitigation Measure TMN-MM-4: Plans and Practices within the Proposed ATF
Impact TMN-2: Level of Service for Non-Project Boaters	Less than Significant with Mitigation Mitigation Measure TMN-MM-1: Follow U.S. Coast Guard Requirements Mitigation Measure TMN-MM-2: Coordination with the U.S. Coast Guard Vessel Traffic Service	Less than Significant with Mitigation Mitigation Measure TMN-MM-1: Follow U.S. Coast Guard Requirements Mitigation Measure TMN-MM-2: Coordination with the U.S. Coast Guard Vessel Traffic Service	Less than Significant with Mitigation Mitigation Measure TMN-MM-1: Follow U.S. Coast Guard Requirements Mitigation Measure TMN-MM-2: Coordination with the U.S. Coast Guard Vessel Traffic Service	Less than Significant with Mitigation Mitigation Measure TMN-MM-1: Follow U.S. Coast Guard Requirements Mitigation Measure TMN-MM-2: Coordination with the U.S. Coast Guard Vessel Traffic Service Mitigation Measure TMN-MM-3: Channel Navigation and Maneuverability Mitigation Measure TMN-MM-4: Plans and Practices within the Proposed ATF

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact TMN-3: Roadway Traffic	Less than Significant	Less than Significant	Less than Significant	Less than Significant
Impact TMN-4: Interfere with Emergency Response Plans or Emergency Evacuation Plans	Less than Significant with Mitigation Mitigation Measure TMN-MM-1: Follow U.S. Coast Guard Requirements Mitigation Measure TMN-MM-2: Coordination with the U.S. Coast Guard Vessel Traffic Service Mitigation Measure TMN-MM-3: Channel Navigation and Maneuverability Mitigation Measure TMN-MM-4: Plans and Practices within the Proposed ATF	Less than Significant with Mitigation Mitigation Measure TMN-MM-1: Follow U.S. Coast Guard Requirements Mitigation Measure TMN-MM-2: Coordination with the U.S. Coast Guard Vessel Traffic Service Mitigation Measure TMN-MM-3: Channel Navigation and Maneuverability Mitigation Measure TMN-MM-4: Plans and Practices within the Proposed ATF	Less than Significant with Mitigation Mitigation Measure TMN-MM-1: Follow U.S. Coast Guard Requirements Mitigation Measure TMN-MM-2: Coordination with the U.S. Coast Guard Vessel Traffic Service Mitigation Measure TMN-MM-3: Channel Navigation and Maneuverability Mitigation Measure TMN-MM-4: Plans and Practices within the Proposed ATF	Less than Significant with Mitigation Mitigation Measure TMN-MM-1: Follow U.S. Coast Guard Requirements Mitigation Measure TMN-MM-2: Coordination with the U.S. Coast Guard Vessel Traffic Service Mitigation Measure TMN-MM-3: Channel Navigation and Maneuverability Mitigation Measure TMN-MM-4: Plans and Practices within the Proposed ATF
4.12 AIR QUALITY				
Impact AQ-1a: Project-related Criteria Pollutant Emissions: Construction Emissions	Less than Significant with	Less than Significant with Mitigation Mitigation Measure AQ-MM-1: Emission Monitoring Mitigation Measure AQ-MM-2: Criteria Pollutants Emission Control	Less than Significant with Mitigation Mitigation Measure AQ-MM-1: Emission Monitoring Mitigation Measure AQ-MM-2: Criteria Pollutants Emission Control	Less than Significant with Mitigation Mitigation Measure AQ-MM-1: Emission Monitoring Mitigation Measure AQ-MM-2: Criteria Pollutants Emission Control
Impact AQ-1b: Project-related Criteria Pollutant Emissions: Operations Emissions	Less than Significant	Less than Significant	Less than Significant	Less than Significant

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact AQ-1c: Project-related Criteria Pollutant Emissions: Transportation Emissions	Less than Significant	Beneficial	Beneficial	Beneficial
Impact AQ-2: Project-related Toxic Air Contaminant Emissions	Less than Significant	Less than Significant	Less than Significant	Less than Significant
Impact AQ-3: Project-related Odor Emissions	Less than Significant	Less than Significant	Less than Significant	Less than Significant
Impact AQ-4: Project-related Greenhouse Gas Emissions	Less than Significant	Less than Significant	Less than Significant	Less than Significant
4.13 NOISE				
Impact NO-1: Exposure of Existing Residences and Shoreline Recreation Areas to Construction Noise in Excess of Local Standards	Less than significant.	Less than significant.	Less than significant.	Less than significant.
Impact NO-2: Exposure of Existing Residences and Shoreline Recreation Areas to Operational Noise in Excess of Local Standards	Less than significant.	Less than significant.	Less than significant.	Less than significant with mitigation Mitigation Measure NO-MM-1: Employ Noise-Reducing Operation Practices and Controls
4.14 AESTHETICS				
Impact AE-1: Substantially Adversely Affect Scenic Vistas of San Pablo Bay	Less than significant.	Less than significant.	Less than significant with mitigation. Mitigation Measure AE-MM-1: Surface Treatment to Reduce Daytime Glare	Less than significant.

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact AE-2: Substantially Degrade Existing Visual Character or Quality	Less than significant.	Less than significant.	Less than significant with mitigation. Mitigation Measure AE-MM-1: Surface Treatment to Reduce Daytime Glare	Less than significant.
Impact AE-3: Create a New Source of Substantial Light or Glare	Less than significant.	Less than significant.	Less than significant with mitigation. Mitigation Measure AE-MM-1: Surface Treatment to Reduce Daytime Glare	Less than significant with mitigation. Mitigation Measure AE-MM-2: Shield Booster Station to Reduce Daytime Glare

Chapter 1
Purpose and Need

This chapter provides an overview of the proposed Hamilton Wetlands Restoration Project Dredged Material Aquatic Transfer Facility (proposed action[1] or proposed ATF) and the associated Hamilton Wetlands Restoration Project (HWRP)[2]. The following topics relative to the proposed project are discussed below: the state and federal authority under which the proposed action is being developed, the purpose and need, the relationship to other projects and plans, the intent and scope of this document, and public concerns and planning considerations.

1.1 Overview of the Proposed Project and Alternatives

The U.S. Army Corps of Engineers (USACE) and California State Coastal Conservancy (Conservancy), in collaboration with the San Francisco Bay Conservation and Development Commission (BCDC), are proposing a dredged material transfer facility to be used in restoring tidal wetlands at the HWRP. The previously authorized HWRP provides for the use of a dredged material off-loader facility to receive and transport dredged materials from San Francisco Bay Area dredging projects to the HWRP. Should the proposed ATF be approved and constructed, it would be located in the same general vicinity as the existing in-Bay dredged material disposal site SF-10[3] (see Figure 1-1).

The authorized use of a hydraulic off-loader (Alternative 1: No Action) would accommodate dredged material pumped from dredge scows[4] docked adjacent to the floating off-loader and subsequently pumped as slurry through a transfer pipeline to the HWRP site. The other three alternatives considered in this document include: an unconfined in-Bay aquatic transfer basin in San Pablo Bay with associated slurry pipeline (Alternative 2: Unconfined ATF); a confined in-Bay aquatic transfer basin in San Pablo Bay with associated slurry pipeline (Alternative 3: Confined ATF); and a newly

[1] The term *project* as used in this SEIS/EIR refers explicitly to the term as defined under the CEQ's NEPA regulations and the State CEQA Guidelines: "the entirety of an action which has a potential for resulting in a physical change in the environment." The terms "proposed action" and "proposed project" are used interchangeably in this document. Both terms are used when identifying the project in general terms, and not as a specific alternative.
[2] The HWRP project includes the original 950-acre HWRP project site (Hamilton Army Airfield, Navy Ballfields, and the State Lands Parcel) and the 1,576-acre Bel Marin Keys Unit V (BMKV) expansion of the HWRP project. Now that the BMKV expansion of the HWRP is Congressionally authorized, there is only one HWRP "project," which encompasses a total of 2,526 acres. This document only refers to the HWRP as a single project and site. Where reference is made to the physical area of the BMKV portion of the HWRP, it is noted as "BMKV site."
[3] SF-10 is an existing EPA-designated in-Bay dredged material disposal site located approximately 3 miles northeast of Point San Pedro in San Pablo Bay.
[4] A scow is a large flat-bottomed boat with broad square ends used chiefly for transporting bulk material.

excavated channel for dredged material delivery from the SF-10 area to a landside transfer basin on the BMKV site (Alternative 4: Direct Channel to BMKV Basin). The proposed action is Alternative 2: Unconfined ATF; this alternative is also proposed as the preferred alternative. See Figures 1-1 and 1-2 for the proposed ATF and alternatives' features.

This document is a supplemental environmental impact statement/environmental impact report (SEIS/EIR) to the HWRP EIS/EIR (USACE 1998) and BMKV SEIS/EIR (USACE 2003). Developed in accordance with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), the intent of this SEIS/EIR is to

- identify potential direct, indirect, and cumulative environmental impacts associated with the proposed project and alternatives;
- describe mitigation measures intended to avoid potentially significant impacts of the project and alternatives or reduce them to a less than significant level; and
- disclose potential impacts of the project and alternatives and proposed mitigation measures for public review and comment.

1.1.1 Relationship to the Hamilton Wetland Restoration Project

The HWRP is in an unincorporated area southeast of Novato, in Marin County, California. The HWRP and BMKV sites historically supported tidal salt marsh habitat, but levee construction around 1900 separated the area from the tidal influence of San Pablo Bay. Both sites have since been used for agriculture. On the HWRP site, 644 acres (ac) (261 hectares [ha]) were converted for use as a military airfield in the 1930s. The BMKV site has remained agricultural and currently supports hay production.

The HWRP enables restoration of tidal wetlands through the beneficial use of dredged material from San Francisco Bay navigation projects; current elevations on the site would be subtidal if levees were breached without first raising site elevations. The HWRP requires approximately 24.4 million cubic yards (mcy) (18.6 million cubic meters [Mm^3]) of dredged material to complete construction. The dredging projects that would supply the material are located throughout San Francisco and San Pablo Bays.

As described in the 1998 HWRP EIS/EIR and 2003 BMKV SEIS/EIR (which are incorporated by reference in this document), the authorized means of transporting dredged material to the HWRP is via a hydraulic off-loader in San Pablo Bay that pumps the dredged material to the site through a submerged pipeline. Independent review, workshops with national experts, and a value engineering (VE) [5] study that considered environmental, economic, and operational effects determined that a more efficient and flexible method of transferring dredged material should be evaluated. Therefore, this SEIS/EIR evaluates alternative methods for transfer of dredged material to the HWRP site (see Figure 1-1).

[5] A VE study is an analysis of materials, processes, and products in which functions are related to costs. A VE study allows for a project to be defined or redefined such that the project achieves the desired function within the performance guidelines at the lowest overall cost.

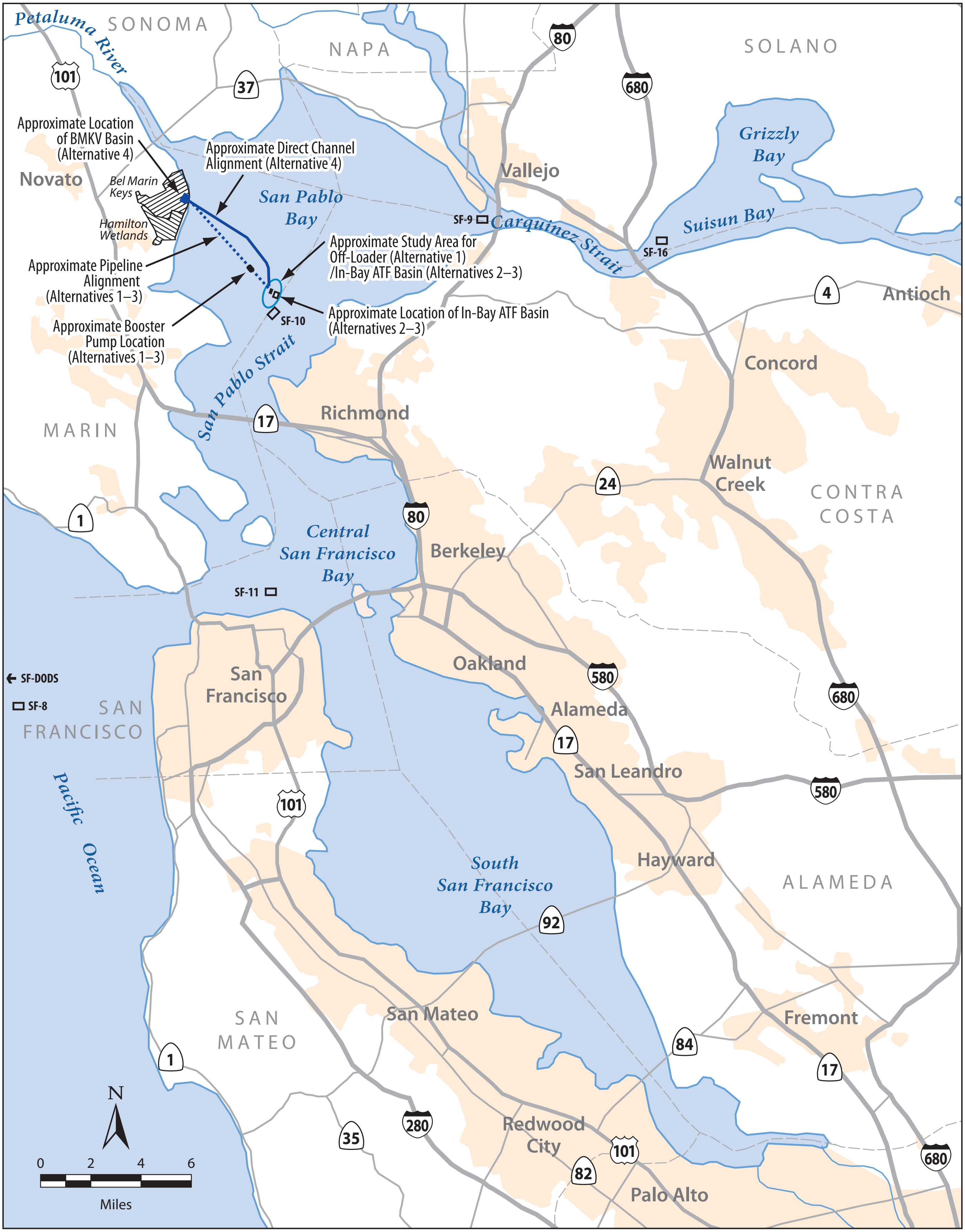

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Figure 1-1
Regional Location

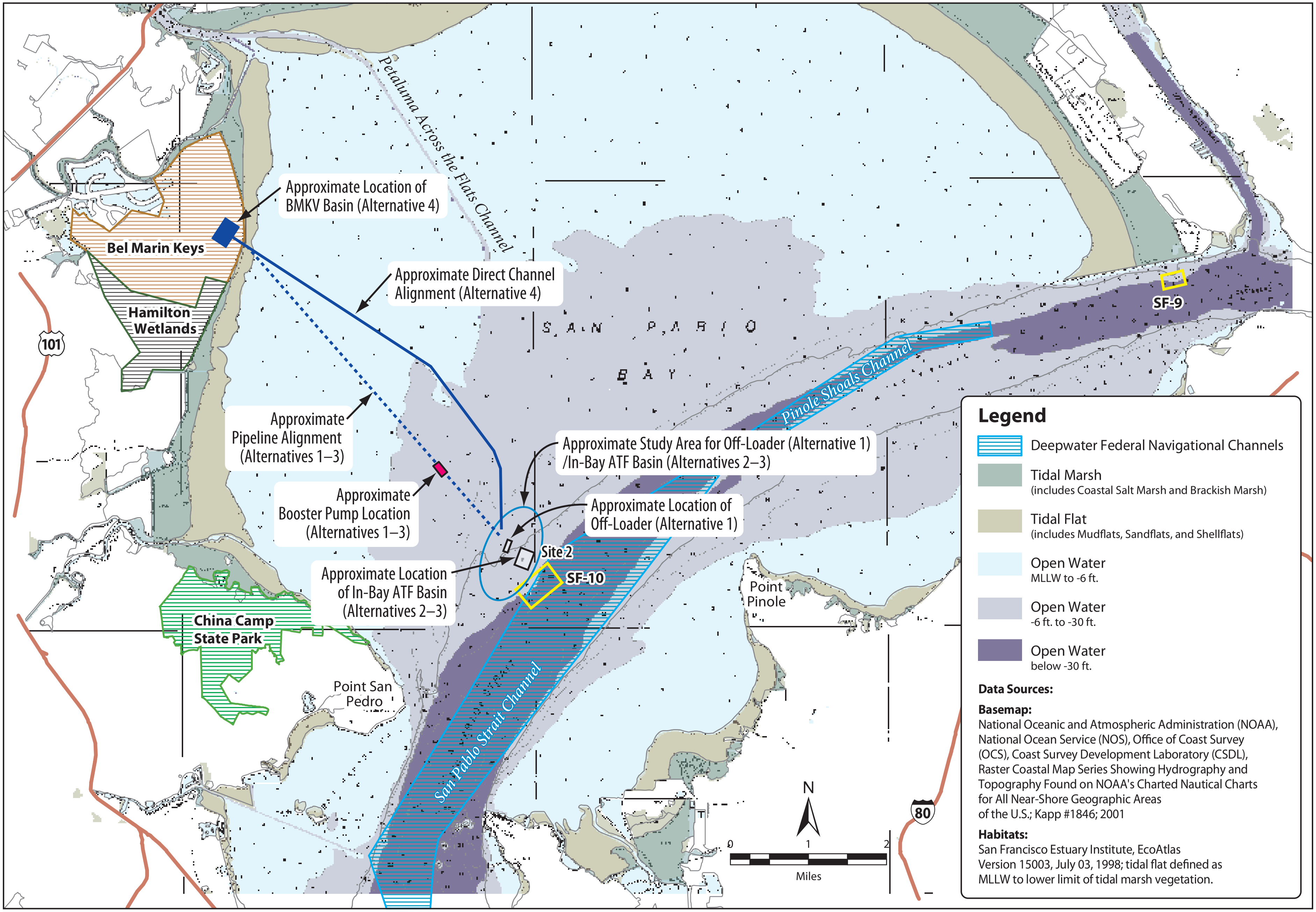

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Figure 1-2
General Study Area

1.1.2 Statutory Authority

USACE is the federal lead agency for this draft SEIS/EIR, and is authorized under Section 204 of the Water Resources Development Act (WRDA) of 1992 (33 U.S Government Code (USC) 2326) to carry out projects for the protection, restoration, and creation of aquatic and ecologically related habitats, including wetlands, in connection with dredging for construction, operation, and/or maintenance of an authorized navigation project. Under this authority, such projects may be undertaken if the environmental, economic, and social benefits of the project would justify the cost thereof, and if the project would not result in environmental degradation. USACE was authorized under Section 101(b)(3) of the WRDA of 1999 (113 Stat. 279) to implement the HWRP at a cost of approximately $301.7 million. Section 3018 of the WRDA of 2007 (H.R. 1495-70) modified the HWRP to include the BMKV site. The proposed ATF, if approved and executed, would support implementation of the HWRP.

The Conservancy is the state lead agency for this draft SEIS/EIR and was created by the state legislature for the purpose of developing and sponsoring environmental projects that protect, preserve, and enhance coastal resources along the 1,100-mile (mi) (approximately 1,770-kilometer [km]) California coastline, and around San Francisco Bay. The Conservancy's broad authority enables its participation in a diverse array of projects involving habitat creation, enhancement, and restoration. In 2001, the Conservancy purchased the BMKV property with the intent of including it as an expansion of the HWRP, as is currently. The proposed ATF would enable more timely construction of the HWRP thereby reducing overall costs associated with restoration of the BMKV site.

1.2 Overview of NEPA and CEQA

When a project is subject to review under both NEPA and CEQA, state and local agencies are encouraged to cooperate with federal agencies in the environmental review process and prepare a joint environmental document. USACE and Conservancy have determined that the proposed ATF could significantly affect the environment and have therefore, prepared this joint SEIS/EIR.

1.2.1 NEPA Overview

NEPA (42 USC 4321; 40 Code of Federal Regulations [CFR] 1500.1) is the nation's broadest environmental law. NEPA applies to all federal agencies and to most of the activities they manage, regulate, or fund that affect the environment. It requires all federal agencies to consider and publicly disclose the environmental implications of their proposed actions through the preparation of appropriate documents. The President's Council on Environmental Quality (CEQ) has adopted regulations and other guidance that provide detailed procedures for implementation of NEPA. NEPA requires that every federal agency prepare an EIS for proposed legislation or other major federal actions "significantly affecting the quality of the human environment" (42 USC 4332; 40 CFR 1501).

1.2.2 CEQA Overview

CEQA (13 California Public Resources Code [CPRC] 21000; 14 California Code of Regulations [CCR] 15000) requires state and local agencies to estimate and evaluate the environmental implications of their actions and aims to prevent adverse environmental impacts of those actions by requiring those agencies, when feasible, to avoid or reduce significant environmental impacts. The California Governor's Office of Planning and Research (OPR) has adopted detailed guidance for compliance with CEQA. CEQA requires that the lead agency prepare an EIR when the lead agency determines that a project may have a significant effect on the environment.

1.2.3 Preparation of this SEIS/EIR

Per the CEQ NEPA regulations (40 CFR 1502.9[c][2]), this draft SEIS/EIR is a "supplemental" EIS; per the CEQA Guidelines (14 CCR 15162), it is a "subsequent" EIR. Under both regulations, the lead agency must prepare secondary environmental documentation if it determines on the basis of substantial evidence in light of the whole record that:

- substantial changes proposed in the project will generate new significant environmental effects or a substantial increase in the severity of previously identified effects,
- substantial changes in the circumstances under which the project is undertaken will generate new significant environmental effects or a substantial increase in the severity of previously identified effects, or
- new information of substantial importance relevant to the environmental concerns that bear on the proposed action have been identified.

1.2.4 Participating Agencies

As described above, USACE and Conservancy, with technical advice from BCDC, are restoring tidal wetlands on the HWRP under the proposed action. The proposed ATF would facilitate restoration by providing a means of transporting dredged materials to the restoration sites. USACE and Conservancy serve as the federal and state lead agencies, respectively, for the proposed ATF and SEIS/EIR. BCDC has been working closely with USACE and Conservancy providing technical advice during the planning and design phase for the HWRP, including the proposed ATF. Additionally, the U.S. Environmental Protection Agency (USEPA) was involved in consulting and participating with the lead agencies throughout the HWRP and associated facilities' planning process.

1.3 Purpose and Need and Project Objectives

1.3.1 Project Need

Alternative 1: No Action, was established as a means to transport dredged material from San Francisco Bay dredging projects for beneficial use at the HWRP restoration site. Restoration of tidal wetlands on subsided diked baylands using dredged material provides an opportunity to offset historic wetland habitat loss and beneficially use suitable dredged material, rather than disposing it at in-Bay or ocean disposal sites.

As part of the VE study conducted by USACE for the HWRP, identified restrictions related to construction and operation costs, operational flexibility, and efficiency of dredged material transport for beneficial use of dredged material at the HWRP site.

Specifically, the proposed ATF could accommodate most San Francisco Bay dredging projects with clean suitable material, rather than only those projects with dredged material transport vessels equipped to utilize the off-loader as under Alternative 1. Additionally, the proposed ATF would be available to receive dredged sediment all year. Thus, the proposed ATF would maximize the operational flexibility of the HWRP to accommodate dredged material from both large and small dredging projects, as well as maximize the potential for beneficial use of dredged material at the HWRP site. The proposed ATF would significantly reduce standby time and costs. Furthermore, it would eliminate scheduling conflicts that result when delivery vessels are forced to queue because the off-loader only allows for one vessel to moor alongside and unload dredged material at any one time. This would prevent delays to operations at the HWRP site, as dredged material placement activities and subsequent transfer and beneficial use could occur independently.

1.3.2 Project Purpose and Objectives

The purpose of the proposed ATF is to maximize efficiency of the dredged material use operation by providing operational flexibility and cost efficiency during transfer of dredged material to the HWRP site. This will enable restoration construction in nearly half the time as the authorized off-loader facility (from approximately 18 years to 10 years), thereby facilitating wetland habitat restoration benefits in the San Francisco Bay area.

Project objectives include the following:

- Offer operational flexibility for the type and size of dredged material transport vessels that could deliver material for beneficial use at the HWRP site;
- Using more potential sources of dredged material and the capability to stockpile dredged material for future beneficial use under the HWRP when the site is not actively accepting material (rather than disposing of dredged material at in-Bay and ocean sites);
- Provide a reliable, cost effective means of transporting dredged material to the HWRP site; and
- Facilitate implementation of the Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region (LTMS) through beneficial use of dredged material.

1.4 Current Status

Wetlands restoration under the HWRP was addressed in the 1998 HWRP EIS/EIR (USACE 1998) and the 2003 BMKV SEIS/EIR (USACE 2003). Construction of the HWRP, including the authorized use of a hydraulic off-loader, was authorized by Section 101(b)(3) of the WRDA of 1999 (113 Stat.

279). Utilizing the existing off-loader (a separate facility), the HWRP site is currently receiving dredged material. Section 3018 of the WRDA of 2007 (H.R. 1495-70) modified the HWRP to include the BMKV site.

The proposed ATF under consideration by USACE and Conservancy would be an alternative to the existing, authorized off-loader facility (Alternative 1: No Action) for transport of dredged material to the project site. Whether the proposed project goes forward or not, the authorized use of the hydraulic off-loader will continue to place dredged material under the HWRP.

1.5 Scope of SEIS/EIR

This SEIS/EIR describes the features of the proposed project and alternatives, including the No Action Alternative. As required by NEPA and CEQA, it evaluates the potential impacts of the proposed ATF and alternatives on the following resource topics.

- Geology and seismicity
- Circulation and sedimentation
- Water and sediment quality
- Marine and terrestrial biological resources
- Environmental justice, population, and housing
- Cultural resources
- Land use
- Recreation and commercial fishing
- Petroleum and hazardous materials
- Transportation and marine navigation
- Air quality
- Noise
- Aesthetics
- Greenhouse gas emissions and climate change

1.6 Project Area

This SEIS/EIR will focus primarily on San Pablo Bay, with a particular emphasis on central and western parts of San Pablo Bay which may be affected by the proposed action and alternatives ATF. Figure 1-1 shows the regional location of the proposed project and authorized off-loader, and Figure 1-2 shows the project area. The project area includes open water where the authorized off-loader (Alternative 1) or in-Bay ATF sites (Alternatives 2-3) would be located; the shallow bay and mudflat area between SF-10 and the restoration site where the dredged material transfer pipeline (Alternatives 1-3) and/or direct channel (Alternative 4) may be aligned; and the 60-ac (24.2-ha) portion of the BMKV site where a landward basin may be excavated (Alternative 4). For some resource topics (e.g., circulation and sedimentation, marine biology, air quality), this document also discusses conditions in the larger San Francisco Bay and/or Sacramento-San Joaquin River Delta. Chapter 3, *Affected Environment*, provides a detailed description of the affected environment in the proposed project area.

The marine portions of the project area (including the off-loader, dredge material transfer pipeline, the ATF basin and access channel, and the direct channel) are located in navigable waters within San Pablo Bay, which is subtidal land under the jurisdiction of the California State Lands Commission.

However, the HWRP is an implementing action of the Long Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region (LTMS, see discussion below) and is directly related to the Port of Oakland -50 foot dredge project and federal operations and maintenance projects for navigation. Both the LTMS and the HWRP have a navigational purpose. The HWRP also has an ecosystem restoration purpose. The federal government can use state or private land for navigational purposes under the "navigational servitude" doctrine. This doctrine derives its authority from the commerce clause of the U.S. Constitution giving the U.S. Congress regulatory power over navigable waters. Due to the utilization of a navigational servitude, the proposed project will not require a lease from the State of California for use of state tidal lands. The onshore portion of the project, which would include the onshore portion of the dredged material pipeline and the location of the BMKV basin under Alternative 4, is owned by the Conservancy which is the local sponsor of the HWRP.

1.7 Relationship to Other Projects and Plans

In general, the proposed action directly supports the HWRP, and contributes to implementation of the LTMS and other regional planning efforts. The programs and projects listed below are related to the proposed action through statutory authority.

1.7.1 Hamilton Wetlands Restoration Project

The authorized HWRP site is located northwest of the proposed ATF project area. The proposed action is part of the HWRP. Section 1.1.1 Relationship to the Hamilton Wetland Restoration Project describes the proposed project's relation to HWRP.

The HWRP would ultimately provide approximately 2,526 ac (1,022 ha) of habitat, including 570 ac (about 231 ha) of restored tidal wetlands. The transfer pipeline crosses the outboard marsh and was constructed in 2002. A separate Subsequent EIR was completed in 2003 for a Remedial Action Plan required for contaminant cleanup at the HAAF site. Approximately 250,000 cy (191,139 cubic meters [m^3]) of dredged material was transferred from the BMKV lagoon to HWRP in July 2007. Placement of the dredged material from the Port of Oakland -50 Foot project (described below) out of the HWRP site began in December 2007. The HWRP is presently in the construction phase.

The goal of the HWRP is to create a diverse array of seasonal and tidal wetlands and wildlife habitats that benefits threatened and endangered species, as well as resident and migratory fish, wildlife, and bird species. In addition, objectives of the HWRP include designing and engineering a restoration project that stresses simplicity and has little need for active management; demonstrating beneficial use of dredged material; ensuring no net loss of wetland habitat functions presently provided at the site; and providing public access that is compatible with protection of resource values.

1.7.2 Oakland Harbor Navigation Improvement (-50-Foot) Project

USACE and the Port of Oakland adopted a plan to deepen the federal channels of the Oakland Harbor and port-maintained berths to a depth of -50 feet mean lower low water (MLLW) to accommodate the newest generation of deep-draft container ships. The Final EIS/EIR for the Oakland Harbor Navigation Improvement (-50-Foot) Project was completed in 1998; and the -50 foot deepening project was authorized under Section 101(a)(7) of the WRDA of 1999 (113 Stat. 275). The -50–Foot deepening project involves dredging and disposal of 12 to 14.5 mcy (9.1 to 11 Mm^3) of bay sediments. HWRP is one of four sites identified for placement and use of the resulting dredged material from the -50–Foot project dredging activities are expected to be completed in June 2009; however, other components of the project will extend beyond this date.

It is important to note that the off-loader currently transferring dredged material from the -50–Foot deepening project to the HWRP is a separate off-loader facility (the “Liberty”) commissioned by the Port of Oakland. Under the proposed action, the authorized off-loader for the HWRP could be a separate, albeit similar, facility. The selection of the authorized off-loader for use under the proposed action is currently being evaluated by USACE and Conservancy.

1.7.3 Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region and National Estuary Program

1.7.3.1 Long-Term Management Strategy

An interagency cooperative effort, the LTMS, was established in 1991 to resolve dredged material disposal issues. USACE is a partner in the LTMS Program along with the Environmental Protection Agency (EPA), BCDC, State Water Resources Control Board (SWRCB), and San Francisco Bay Regional Water Quality Control Board (RWQCB), with technical assistance from the National Oceanic and Atmospheric Administration – Fisheries (NOAA-Fisheries), United States Geological Survey (USGS), and the United States Fish and Wildlife Service (USFWS). Other LTMS participants include California Department of Fish and Game (CDFG), and State Lands Commission (SLC), as well as navigation interests, fishing groups, environmental organizations, and other interested parties. The goals of the LTMS include disposing dredged material in the most environmentally sound manner and maximizing the use of dredged material as a resource. The Record of Decision for the LTMS EIS/EIR was signed in July 1999, committing USACE to implementing beneficial use options. USACE signed the 2001 LTMS Management Plan in January 2002. Both the HWRP and BMKV properties were evaluated as part of a comprehensive review by the LTMS agencies as potential sites for beneficial use. Both sites were found to be highly feasible for wetlands restoration using dredged material.

In the USACE's 2001 LTMS Management Plan, the LTMS agencies agreed on a strategy of decreasing in-Bay disposal (known as the 40/40/20 Goal) over time: to no more than 20% of the annual volume of material dredged from San Francisco Bay maintenance dredging project and beneficially use at least 40% of the material. The LTMS Management Plan, however, recognized that the transition from present disposal practices to the 40/40/20 Goal would not be immediate, but rather would be implemented gradually over a 12-year period. This phased approach is intended to reduce economic dislocations to dredgers by allowing time for new equipment and practices to be implemented, funding mechanisms and arrangements to be established, and permits to be obtained. In addition, this phased approach would allow new beneficial use sites (such as HWRP and BMKV) to come on line, thereby expanding the options for dredged material placement. The LTMS transition is in its eighth year as of 2008. An efficient means of transporting dredged material to HWRP is considered critical to meeting LTMS goals after the transition period ends in 2012.

1.7.3.2 National Estuary Program

In 1987, Congress reauthorized the Clean Water Act (CWA) establishing the National Estuary Program (NEP) (CWA Section 320) to identify estuaries of national significance that are threatened by pollution, land development, and/or overuse, and to provide grants to support comprehensive management plans to restore and protect these estuaries. The USEPA was charged with administering Section 320 of the CWA. To date, the NEP has been successful in focusing on watersheds, using science to inform decision-making, implementing collaborative problem solving, involving the public in the planning process, and developing long-term sustainable financing strategies.

Twenty-eight estuaries were included in the 1987 NEP, including San Francisco Estuary. Each of the 28 estuaries in the NEP was charged with developing and implementing a collaboratively based Comprehensive Conservation and Management Plan (CCMP). The CCMP serves as a blueprint to guide future decisions and actions and addresses a wide range of environmental protection issues (e.g., water quality, habitat, fish and wildlife, pathogens, land use, introduced species, and restoration). The CCMP is based on a scientific characterization of the estuary and is developed and approved by a broad-based coalition of stakeholders.

Following inclusion of San Francisco Estuary in the NEP, the San Francisco Estuary Project (SFEP) was established to prepare and implement the San Francisco Estuary CCMP. The SFEP is comprised of federal, state, and local governments, as well as stakeholders and academics, united to preserve, restore, and enhance San Francisco Estuary while maintaining its economic vitality. The San Francisco Estuary CCMP, finalized in 1993, identified five key challenges for San Francisco Estuary, including: 1) decline of biological resources (especially wetlands and related habitats); 2) increased pollution; 3) freshwater diversions and altered flow regime; 4) intensified land use and population; and 5) dredging and waterway modifications.

Since implementation of the 1993 CCMP, the SFEP and its partners have accomplished several NEP goals for San Francisco Estuary, including:

- Acquisition and restoration of nearly 67,000 acres of wetlands, including 16,000 acres of South Bay salt ponds.

- Completion of the Baylands Ecosystem Habitat Goals report, which guided many acquisition and restoration projects in the San Francisco Bay Area.
- Continued development and concurrent implementation of total maximum daily loads (TMDLs) for pathogens, nutrients, salt, selenium, sediment, pesticides, PCBs, oxygen, and mercury.
- Increased San Francisco Estuary appreciation and advocacy through improved access to the estuary lands (e.g., Bay Trail), shoreline cleanups, and restoration projects.
- Increased funding for watershed management.
- Improved water use efficiency through urban water conservation programs and water recycling projects.
- Implementation of the Regional Monitoring Program to track the status and trends of constituents of concern in San Francisco Estuary.
- Development of the multi-agency San Francisco Bay Long-Term Management Strategy for the Placement of Dredged Material in 1990. The LTMS has implemented the majority of the Dredging and Waterway Modification section of the 1993 CCMP, including beneficial use of more than 15 mcy of material dredged from San Francisco Estuary.

Additionally, the SF Deep Ocean Disposal Site (SF-DODS) was designated in 1994 as an alternative to in-Bay disposal, maintenance dredging environmental work windows were developed to protect aquatic organisms, and more than 15 mcy of dredged material was beneficially used (as described above) at Montezuma Wetlands (Solano County), Winter Island (Contra Costa County), Sherman Island (Sacramento County), Oakland Middle Harbor Enhancement Area (Alameda County), Ocean Beach demonstration beach nourishment project (San Francisco County), the portion of the SF-8 disposal site that is in the littoral cell (San Francisco County), HWRP (Marin County), Bair Island (San Mateo County), South Bay Salt Ponds (Santa Clara County), Van Sickle Island (Solano County), Carneros River Ranch (Sonoma County), and several other small or one-time-use sites.

In 2007, SFEP updated the CCMP and identified new concerns affecting San Francisco Estuary, such as global climate change and methylmercury formation, as well as the continued effects of pollutants and legacy contaminants, loss of seasonal wetlands and riparian habitats (which act as ‘transition habitat’ between aquatic and upland habitats), and exotic species.

The LTMS and the NEP CCMP’s *Dredging and Water Way Modification* section shared goals include the following:

- Maintain in an economically sound manner those channels necessary for navigation in San Francisco Bay and Estuary and eliminate unnecessary dredging (San Francisco Bay LTMS and CCMP goal).
- Conduct dredging activities in an environmentally sound manner (CCMP goal).
- Conduct dredged material disposal in the most environmentally sound manner (San Francisco Bay LTMS goal).
- Maximize the use of dredged material as a beneficial source (San Francisco Bay LTMS and CCMP goal).
- Establish a cooperative permitting framework for dredging disposal operations (San Francisco Bay LTMS goal).

- Continue to develop and implement a comprehensive Sediment Management Strategy for dredging and waterway modification (CCMP goal).
- Manage modification of waterways to avoid or offset the adverse impacts of dredging, flood control, channelization, and shoreline development and protection projects (CCMP goal).
- Reduce in-Bay disposal to no more than 20% of the annual volume of material dredged from San Francisco Bay maintenance dredging project and beneficially use at least 40% of the material (San Francisco Bay LTMS goals).

The proposed ATF would allow for the goals of the LTMS to be further realized by reducing in-Bay or ocean disposal by an additional 1.0 mcy per year and reducing the amount of time required to restore wetlands at the HWRP site (from 18 to 10 years), compared to the No-Action alternative. In addition, reducing the effects of in-Bay disposal on aquatic organisms and restoring approximately 2,526-acres at the HWRP and BMKV sites would meet the goals of the SFEP.

1.7.4 San Francisco Bay Plan

The McAteer-Petris Act of 1965 (amended in 1969) established BCDC to guide future protection and use of San Francisco Bay and its shoreline through development of the San Francisco Bay Plan (Bay Plan). BCDC is the federally designated state coastal management agency for San Francisco Bay, which empowers it to use the authority of the federal Coastal Zone Management Act to ensure that federal projects and activities are consistent with the policies of the Bay Plan. The Bay Plan, which was completed in January 1969, includes policies on the wise use of the Bay, ranging from ports and public access to transportation and wildlife refuges.

In 1996, BCDC amended the Bay Plan maps to designate the HAAF for wildlife use through the development of a comprehensive wetland habitat plan and a long-term management program to restore and enhance wetland habitat in former diked baylands. In accordance with the LTMS, the Bay plan also indicates that dredged materials should be used whenever feasible and environmentally acceptable to facilitate wetland restoration. In April 2002, BCDC further amended the findings and policies of the Bay Plan regarding marshes and mudflats, subtidal areas, and fish and wildlife. Current maps of the Bay Plan include a BCDC suggestion regarding the “possible use of Bel Marin Keys Unit V as a wetland restoration site using dredged material.”

1.7.5 Ecosystem Restoration Program Plan

Under the interagency CALFED Bay–Delta Program (CALFED), a framework agreement was signed by state and federal agencies to address various problems in the Bay–Delta region. The agreement provided a combination of state and federal funding for three specific purposes: the development of water quality standards (Category I), water projects (Category II), and habitat restoration (Category III). To clarify Category III goals and objectives, CALFED produced a draft Ecosystem Restoration Program Plan that describes the important ecological processes, habitats, species, and stressors of the San Francisco Bay ecosystem. The HWRP was determined to be consistent with the visions and policies presented in the draft Ecosystem Restoration Program Plan and received CALFED Category III funding.

1.7.6 San Francisco Bay Area Wetlands Ecosystem Goals Project

The San Francisco Bay Area Wetlands Ecosystem Goals Project (Goals Project) was a 5-year volunteer collaborative effort completed in 1998. Sponsored by agencies and organizations that included USEPA, RWQCB, CDFG, and the San Francisco Estuary Institute (SFEI), the Goals Project is intended to provide guidance to public and private stakeholders interested in restoring and enhancing the wetlands and related habitats of the San Francisco Bay ecosystem. Regionwide goals include restoration of large tidal marshes connected by wildlife corridors to enable the movement of small mammals and marsh-dependent birds; restoration of large complexes of salt ponds for the management of shorebirds; and expansion of large areas of managed marsh. One of the specific recommendations in the Goals Project is to “restore a wide, continuous band of tidal marsh along the bayfront between Black Point and Gallinas Creek” (which includes the HWRP and BMKV sites).

1.7.7 The Marin Countywide Plan

The Marin Countywide Plan is a long-range comprehensive plan that governs growth and development in the unincorporated areas of Marin County. The HWRP and BMKV sites are located within the City-Centered Corridor planning area of Marin County and are designated for agricultural and conservation land uses. The HWRP and BMKV sites are zoned within the Bayfront Conservation Zone, which is intended to preserve, protect, and enhance existing species and habitat diversity in the county.

1.8 Public Involvement and Scoping

The intent of both NEPA and CEQA is to establish opportunities for the public to review and comment on projects that may affect the environment. Both NEPA and CEQA provide for public participation through the following processes.

- **Project Scoping**. Scoping refers to the process used to determine the focus and content of an EIS/EIR, including early public and interagency consultation. The lead agencies held a public meeting on January 26, 2005, to introduce interested members of the public to the proposed project and solicit public input. The lead agencies formally initiated the scoping process in January 2005 by publishing a Notice of Intent (NOI) in the Federal Register and submitting a Notice of Preparation (NOP) to the California State Clearinghouse.
- **Formal Public Review of Draft SEIS/EIR.** The lead agencies will submit a Notice of Availability (NOA) to the Federal Register and a Notice of Completion (NOC) to the California State Clearinghouse and interested parties announcing the availability of this draft SEIS/EIR for a 45-day public review and comment period. The public review and comment period will be held from October 17, 2008 to December 1, 2008. The lead agencies will hold a public meeting on November 12, 2008 at the USACE Bay Model Visitor Center in Sausalito, California, to solicit any verbal comments on this draft SEIS/EIR.
- **Responses to Comments and Final SEIS/EIR**. Following the public review and comment period, USACE and Conservancy will collate and address all environmental comments received

on the draft SEIS/EIR. While CEQA does not require a formal public comment period on a final EIR, NEPA requires the lead agencies to circulate the final SEIS/EIR for a 30-day review and comment period prior to the certification and filing of a Record of Decision (ROD).

1.8.1 Issues of Concerns Raised During Scoping

During the planning process, the lead agencies held a public meeting to introduce the project to interested members of the public and solicit public input. The public meeting was held on January 26, 2005. Public comments received at this meeting were recorded for consideration during the planning process. In addition, participants were encouraged to submit written comments to the USACE and Conservancy during the public comment period.

Key issues of public concern that were raised during the scoping process include the following:

- Noise generation from the transfer facility operations (impacts on both humans and fish)
- Potential for navigation safety issues, especially oil tanker movement through San Pablo Bay
- Potential for odor, toxicity (heavy metals such as mercury), or air quality threat from the dredged material
- Timeline for creation of tidal wetlands, based on operation of the various alternatives
- Water circulation and sediment transport/siltation (increased turbidity) within San Pablo Bay
- Entrainment of aquatic organisms during slurry of dredged material, and potential impacts of slurry pipeline to species that move along the bottom
- Impacts on commercial and recreational fishing
- Operational impacts (air quality, traffic, noise) from increased large vessel, truck, and train traffic, and other port equipment
- Potential for removal of materials from San Pablo Bay floor to uncover ordnance and/or associated contaminants from Hamilton AFB activities
- Loss of biodiversity, impacts on special-status species and sensitive natural communities, interference with the movement of biotic or terrestrial wildlife, and potential disturbance to bird nesting, rearing, and fledgling activities
- Spread of nonnative invasive species that might be contained in dredged material
- Risk of failure of the confining structure (including emergency response measures)
- Visibility of the transfer facility

Agency and public comments received by USACE and Conservancy during the scoping process are summarized in a Scoping Summary Report, which is included as Appendix H of this document. Further discussion of the public scoping and involvement process for this SEIS/EIR is provided in Chapter 6, *Scoping, Consultation, and Other Requirements*.

Of the public issues raised to date, several may be identified as controversial by certain parties. Those areas of controversy that do not relate to the evaluation of significant effects on the human and physical environment are not within the statutory purview of NEPA and CEQA, and would therefore not be addressed in this SEIS/EIR, but as described above, are recorded and included as part of the record.

1.9 Intended Uses of this SEIS/EIR

The intended uses of this draft SEIS/EIR are to support USACE and Conservancy in making a discretionary decision about the proposed action. This document ensures that the lead agencies have widely considered the potential environmental impacts of the proposed action.

This SEIS/EIR is also intended to supply the information necessary to support additional permit application and review processes related to the proposed action.

1.9.1 State and Federal Permits

State and federal permits and other anticipated approvals necessary for implementation of the proposed project are summarized in Table 1-1. Federal agencies listed in Table 1-1 are considered responsible agencies as defined by NEPA and would use this SEIS/EIR when considering issuance of the identified permits. State agencies listed in Table 1-1 would use this SEIS/EIR to support CEQA compliance prior to issuing for the identified permits.

Table 1-1. State and Federal Permits and Other Anticipated Approvals Necessary for the Proposed Action

Agency	Jurisdiction Related to Project	Areas of Jurisdiction Related to Project	Approvals/Permits
STATE			
Conservancy	Project Sponsor (CEQA Lead Agency)	Project	Approval of project
	Conservancy authorizing legislation	Project	
BCDC	McAteer-Petris Act/ San Francisco Bay Plan	Areas within 100 feet of San Francisco Bay, salt ponds, managed wetlands, and certain waterways	Permit approval for project
	Coastal Zone Management Act	Projects, licenses, permits, and grants that affect the coastal zone	Review of federal permit for consistency
	LTMS partner agency	Use of dredged material	Dredged Material Management Office (DMMO) determinations of sediment suitability
Bay Area Air Quality Management District	Construction emissions	Project area	Potential Permits for Diesel Off-loading and Booster Pumps
California Air Resources Board	Construction emission from portable equipment	Air Emissions	Registration of equipment
San Francisco Regional Water Quality Control Board	Porter-Cologne Water Quality Control Act	Water quality/ discharges	Waste Discharge Requirements for Construction
	CWA Section 401	Existing wetlands/ Waters of the U.S.	CWA Section 401 certification
	CWA Section 402	Stormwater runoff	Stormwater Pollution Prevention Plan
	San Francisco Bay LTMS partner agency	Use of dredged material	DMMO determinations of sediment suitability

Agency	Jurisdiction Related to Project	Areas of Jurisdiction Related to Project	Approvals/Permits
California Department of Fish and Game	California Endangered Species Act (CESA)	Locations/habitat for listed state species	Memorandum of Agreement, if listed state species affected by project
California Department of Toxic Substances and Control	Potentially contaminated sites	Project area	Approval of remediation plans for identified areas of contamination, if needed.
State Lands Commission[1]	Lands subject to Public Trust Doctrine	Project area	Review of permit applications submitted to BCDC.
State Historical Preservation Office	National Historic Preservation Act, Section 106	Potential archaeological and historical sites	Review of USACE Section 106 report
FEDERAL			
USACE	Project Sponsor (NEPA Lead Agency)	Project	Approval of project
	CWA Section 404	Project	Compliance with Section 404(b)(1) Guidelines (though no permit necessary)
	Rivers and Harbors Act of 1899, Section 10	Project	Section 10 Review
	LTMS partner agency	Use of dredged material	DMMO determinations of sediment suitability
USFWS	Federal Endangered Species Act (ESA)	Locations/habitat for listed federal species	ESA Section 7 Consultation
	Fish and Wildlife Coordination Act (FWCA)	Project area	FWCA Report
National Marine Fisheries Service	ESA	Locations/habitat for listed federal species	ESA Section 7 Consultation
	Marine Mammal Protection Act (MMPA)	San Pablo Bay	MMPA Consultation
	FWCA	Project area	FWCA Report
	Magnuson-Stevens Fisheries Conservation	Essential Fish Habitat	Essential Fish Habitat Consultation

Agency	Jurisdiction Related to Project	Areas of Jurisdiction Related to Project	Approvals/Permits
	and Management Act	(San Pablo Bay)	
U.S. Coast Guard	Rivers and Harbors Act of 1899, Section 9	San Pablo Bay	Review of any potential structures within navigable waters (e.g. off-loading and booster pump platforms and transfer pipeline).
EPA	LTMS partner agency	Use of dredged material	DMMO determinations of sediment suitability
	CWA Section 404	Dredging and placement of dredged material	Compliance with Section 404(b)(1) Guidelines
	Marine Protection, Research, and Sanctuaries Act, Sections 102 & 103	Placement of dredged material in ocean	Permit approval for project
	Clean Air Act	Air pollutant emissions	Review of General Conformity Analysis
Advisory Council on Historic Preservation	National Historic Preservation Act, Section 106	Potential archeological and historical sites	Potential Review of USACE Section 106 report.

[1] The applicability of navigational servitude to the proposed project precludes the need for a land lease from the State Lands Commission for those portions of the project area that are under the state's ownership (see discussion under Section 1.6 above).

Chapter 2
Description of Alternatives

This chapter provides an overview of the alternatives development process, describes the features of the proposed action and alternatives, and discusses the alternatives considered but eliminated from further consideration. The HWRP[1] project is not discussed directly in this chapter, except as it relates to the specifications for dredged material transport.

2.1 Alternatives Development Process

USACE and Conservancy considered a wide range of dredged material transfer facility alternatives prior to preparing this draft SEIS/EIR, which were categorized as Tier 1, 2, or 3 alternatives:

Tier 1 includes those alternatives that passed the alternatives screening evaluation as practicable and reasonable alternatives to the authorized off-loader facility.

- Alternative 1: Dredged Material Off-loader Facility (No Action)
- Alternative 2: Unconfined In-Bay ATF (Proposed Action)
- Alternative 3: Confined In-Bay ATF
- Alternative 4:Direct Channel to BMKV Basin

Tier 2 includes one alternative that was considered in the alternatives screening evaluation, but contained environmental impacts such as to render it unfeasible and therefore, is dismissed from detailed analysis in this SEIS/EIR. The reasons for dismissal are discussed later in this chapter.

- Alternative 5: Novato Creek Channel to BMKV Basin

Tier 3 includes alternatives that were eliminated from further consideration during preliminary alternatives screening evaluation due to their infeasibility. The reasons for their elimination are discussed at the end of this chapter.

- Alternative 6: Partially Confined Aquatic Transfer Facility
- Alternative 7: Truck or Rail Transport

[1]The HWRP project includes the original 950-acre HWRP project site (Hamilton Army Airfield, Navy Ballfields, and the State Lands Parcel) and the 1,576-acre Bel Marin Keys Unit V (BMKV) expansion of the HWRP project. Now that the BMKV expansion of the HWRP is Congressionally approved, there is only one HWRP "project," which encompasses a total of 2,526 acres. This document only refers to the HWRP as a single project and site. Where reference is made to the physical area of the BMKV portion of the HWRP, it is noted as "BMKV site."

2.1.1 Alternatives Screening Criteria and Methodology

USACE and Conservancy conducted a preliminary alternatives screening process to identify the range of feasible alternatives for this SEIS/EIR. The preliminary screening resulted in advancement of the following alternatives for further evaluation.

- Alternative 1: Dredged Material Off-loader Facility (No Action)
- Alternative 2: Unconfined In-Bay ATF (Proposed Action)
- Alternative 3: Confined In-Bay ATF
- Alternative 4: Direct Channel to BMKV Basin
- Alternative 5: Novato Creek Channel to BMKV Basin

2.1.1.1 Screening Criteria

According to NEPA, an EIS must rigorously explore and evaluate a reasonable range of alternatives to the project that would attain the basic project purpose and need and project objectives. According to CEQA, an EIR must similarly evaluate a reasonable range of feasible alternatives that could attain most of the basic project objectives; in addition, alternatives must avoid or substantially lessen any of the significant environmental impacts of the proposed project. The alternatives selected for evaluation in this SEIS/EIR were screened for technical, economic, and environmental feasibility to determine whether they were viable alternatives requiring analysis under NEPA and CEQA.

Specific criteria were developed to screen the five potential alternatives in three categories. These criteria are summarized below and described in more detail in Table 2-1 at the end of this chapter.

- **Purpose and Need and Project Objectives—**achievement of the purpose and need and basic project objectives;
- **Implementation Feasibility—**financial, technical, and logistical feasibility; and
- **Environmental Impacts—**effects on the physical, biological, and social components of the ecosystem.

Purpose and Need and Project Objectives

USACE and Conservancy are restoring tidal wetlands at the HWRP site by raising the height of subsided baylands and then breeching existing levees to restore tidal action. The alternatives being considered involve the transport of the necessary dredged material for beneficial use at the HWRP site. The objectives of the dredged material transfer facility are listed in Table 2-1 at the end of this chapter.

Implementation Feasibility

USACE and Conservancy must also consider the financial, technical, and logistical feasibility of construction and operation of a dredged material transfer facility. Logistical barriers associated with the alternatives could create an unreasonable barrier to the implementation of the project. Implementation considerations are presented in Table 2-1 at the end of this chapter.

Environmental Impacts

The environmental impact criteria presented in Table 2-1 are based resource considerations that are relevant to NEPA and CEQA and Clean Water Act (CWA) Section 404(b)(1) Guidelines (40 Code of Federal Regulations [CFR] Part 230, Section 404(b)(1)).

2.1.1.2 Screening Methodology

This section outlines the methodology used for ranking within each criterion, generally using a qualitative approach. For each screening criterion considered, the alternatives were placed in *rank order* with 5 as the highest/best and 1 as the lowest/worst, as shown in the graphic below. Attainment of project objectives, implementation feasibility, and environmental impacts were therefore considered in light of the other alternatives. Table 2-1, located at the end of this chapter, provides a brief justification for the rank order, including quantitative information provided by USACE or Conservancy.

Additionally, if two alternatives achieved a screening criterion to the same degree, they were given the same rank score. In these cases, the rank ordering of alternatives was only numbered 5 as the highest/best through 2 as the lowest/worst (e.g., rank order for the five alternatives may be: 5, 4, 4, 2, 1).

5	**4**	**3**	**2**	**1**

High likelihood that the Alternative will attain or comply with the variable. Significant project component. Beneficial environmental impacts. Clear evidence (e.g., design/engineering) of benefits.

Adequate or marginal contribution to attainment or compliance. Minor project component. Benefits are secondary or undeterminable. Adverse environmental impacts.

If a screening criterion was not applicable to an alternative, "NA" was entered in lieu of a score. Further description of each screening variable is included in Table 2-1 at the end of this chapter.

2.1.2 Summary of Alternatives Evaluation

Using the screening criteria and methodology established above, the five alternatives were scored. The analysis was based on the following documentation, as well as the determination of USACE and Conservancy:

- Hamilton Wetlands Restoration Plan Final EIS/EIR (USACE 1998)
- Bel Marin Keys Unit V Final Supplemental EIS/EIR (USACE 2003)
- LTMS [Long-Term Management Strategy] for the Placement of Dredged Material in the San Francisco Bay Region Final EIS/EIR (USACE 1998)
- Draft Report for Hamilton Wetlands Restoration Project Dredged Material Aquatic Transfer Facility Reconnaissance Assessment (Shaw Environmental 2004)

- Technical Studies for the Alternative Transfer Facility, Hamilton Wetlands Restoration Project (edited by Cacchione 2007)
- Hamilton ATF Alternatives Channel Design (see Appendix B)

Results of the alternatives screening are included in Table 2-1, at the end of this chapter; a summary of the alternative screening conclusions and recommendations follows.

2.1.3 Alternative Screening Conclusions and Recommendations

The alternative screening process was based on a qualitative evaluation of the five potential alternatives for transferring dredged material to the HWRP site for beneficial use. An overview of these potential alternatives was summarized as follows: Alternative 1 has no in-Bay material disposal, but would capture relatively less dredged material for beneficial use due to operational challenges and is a fixed facility in the open Bay; Alternatives 2 and 3 include in-Bay disposal and its associated impacts; and Alternatives 4 and 5 (Direct Channel and Novato Creek Channel to BMKV Basin) reduce in-Bay disposal of dredged material and its associated impacts, but have other impacts related to access channel construction/expansion and maintenance.

The key consideration for identification of alternatives under NEPA and CEQA is that a reasonable range of alternatives be analyzed. The alternatives analyzed must meet the project's objectives, must be potentially feasible, and should avoid or substantially reduce one or more of the project's significant impacts. The following list provides a summary of the conclusions of the screening analysis:

- Alternative 1 is the previously authorized project (the No Action Alternative) and thus must be analyzed.
- Alternative 2 is the preferred alternative in this SEIS/EIR.
- Alternative 3 meets the project's objectives, is feasible for implementation, and reduces some of the environmental impacts of the proposed action, namely turbidity resulting from dredged material placement within the ATF basin.
- Alternative 4 would avoid the excavation of a basin and direct placement of dredged material into San Pablo Bay and the associated water quality and ecological impacts. The tradeoff for avoiding these impacts would be the water quality and ecological impacts associated with excavating and maintaining a lengthy direct channel to BMKV. The footprint of these impacts to San Pablo Bay (233 acres [ac] 94 hectares [ha]) is far larger than footprints of Alternatives 1, 2, and 3. Further, there is uncertainty about the impact to shallow open water and tidal mudflat of excavating the channel and about the scale of maintenance dredging needed to keep the channel open. Despite these concerns, inclusion of Alternative 4 in this SEIS/EIR expanded the range of alternatives addressed and provided a forum for discussion of the tradeoffs between in-Bay disposal and frequent channel maintenance.
- Alternative 5 is similar to Alternative 4, except with greater potential impacts to waters of the U.S., fish and wildlife species habitat, recreational boater traffic, and water and air quality due to dredging of an expanded navigation channel along the Petaluma channel and Novato Creek. Based on the screening process described above, USACE and Conservancy believed that Alternative 5 had an unacceptable level of impacts related to Novato Creek to be consistent with

the overall objectives of the HWRP. As such, Alternative 5 was dismissed from further detailed analysis in this SEIS/EIR.

2.2 Tier 1—Alternatives under Consideration in the SEIS/EIR

The previously approved HWRP provides for the construction and use of a dredged material off-loader facility to receive and transport dredged materials from San Francisco Bay regional dredging projects to the HWRP. This authorized hydraulic off-loader facility is Alternative 1: No Action. The three other alternatives considered in this report include: an unconfined ATF basin in San Pablo Bay with associated transfer pipeline located near SF-10[2] (Alternative 2: Unconfined In-Bay ATF); a confined ATF basin in San Pablo Bay with associated transfer pipeline located near SF-10 (Alternative 3: Confined ATF); and a newly excavated channel for dredged material delivery from the SF-10 area to a landside transfer basin on the BMKV site (Alternative 4: Direct Channel to BMKV Basin).

SF-10 is not proposed for use as an ATF in its current condition because of its dispersive nature. Dredged material placed in SF-10 is quickly dispersed by currents and thus, material placed at this site is not readily available to accumulate and be transferred to the HWRP site. An off-loader or an excavated basin is required to accumulate the dredged material without substantive loss of material. SF-10 would remain open during use of an ATF. However, suitable dredge material that meets the sediment quality requirements for the HWRP would be far more likely to be directed to HRWP than to be placed at SF-10. Thus, SF-10, while open, would be expected to have far more limited activity than at present.

Figures 1-1 and 1-2 in the previous chapter show the regional location and the proposed project area. Table 2-2 describes potentially available dredged material sources for the proposed project. Table 2-3 provides a comparison of the proposed locations, design dimensions, acres of habitat disturbed, as well as the initial and annual maintenance dredging volumes, associated with the proposed action and alternatives.

2.2.1 Information Common to All Alternatives

This section describes information for all alternatives. Specific alternative descriptions follow in subsequent sections.

2.2.1.1 Dredged Material Availability, Estimates, and Project Schedules

The HWRP project requires approximately 24.4 million cubic yards (mcy) of dredged material. Table 2-2 summarizes annual estimates of dredged material volumes sourced from federal projects and from medium and small permitted projects from 2000 to the present. This material, if it meets the sediment quality requirements for the HWRP would potentially be available for beneficial use at the

[2] SF-10 is an existing in-Bay dredged material disposal site located approximately 3 miles northeast of Point San Pedro in San Pablo Bay.

restoration sites. Figure 2-1 illustrates the location of the federal projects. The medium and small permitted projects are located throughout San Francisco Bay, but are not depicted in Figure 2-1.

The total time that the facilities considered in this SEIS/EIR would be operational would range between 9 and 18 years, depending on the alternative ultimately used to transport dredged material to the HWRP site.

- **Alternative 1: Authorized Dredged Material Off-loader Facility (No Action)** would take approximately 18 years (2009–2027). This schedule is determined based on consideration of the likely average annual capacity of the off-loader, which is estimated to be 1.2 mcy per year.
- **Alternative 2: Unconfined In-Bay ATF (Proposed Action)** would take approximately 10 years (2009–2019), receiving all suitable in-Bay dredged project material. The schedule is based on an average receipt of approximately 1.6 mcy of dredged material annually. The annual operational capacity of the ATF (4.0 mcy) is larger and if the annual average is greater than assumed, then the project would be completed earlier.
- **Alternative 3: Confined In-Bay ATF** would take approximately 10 years (2009–2019), receiving all suitable in-Bay dredged project material. The schedule is based on an average receipt of approximately 1.6 mcy of dredged material annually. The annual operational capacity of the ATF (4.0 mcy) is larger and if the annual average is greater than assumed, then the project would be completed earlier.
- **Alternative 4: Direct Channel to BMKV Basin** would take approximately 9 years (2009–2018). Operational constraints may limit dredging projects to clamshell dredge/dump scow delivery. The schedule is based on an average receipt of approximately 1.6 mcy of dredged material annually. The annual operational capacity of the BMKV basin (4.0 mcy) is larger and if the annual average is greater than assumed, then the project would be completed earlier.

One factor that affects the project schedule is San Francisco Bay dredging work windows. The San Francisco Bay LTMS program established programmatic work windows to limit dredging activities during seasons that would adversely impact threatened or endangered species through habitat loss or degradation; interference with migration, breeding, nesting, spawning, or foraging; or entrainment by dredge equipment. Individual project consultation is required when a project is proposed outside of the adopted work windows; the current open windows are June 1 through November 30 for San Pablo Bay. Each dredging project that delivers material to the proposed ATF or alternatives would have a separate work window that corresponds to the dredging project location.

Table 2-2. Potential Dredged Material Sources and Quantities

Source	**All Dredged Material (1)**	**Dredged Material Placed at Designated Disposal Sites only (1, 2)**
Federal Projects (00-07, annual average)		
Alameda Point Channel	11,238	0
Larkspur Ferry Channel	85,748	85,748
Oakland Harbor	361,590	226,514
Petaluma River Channel	4,688	0
Pinole Shoal/Mare Island Strait	148,473	148,473
Redwood City Harbor	201,849	201,849
Richmond Harbor	465,348	465,348
San Francisco Main Ship Channel	293,868	293,868
San Leandro Marina (Jack Maltester Channel)	22,694	0
San Rafael Creek	9,266	3,709
Suisun Bay Channel	198,115	198,115
Subtotal for Federal Projects	1,802,874	1,623,624
Small and Medium Permitted Project (00-06 avg.)(1)	1,563,994	906,792
TOTAL (3)	**3,366,868**	**2,530,416**

Notes:

(1) Dredged Material Management Office (DMMO) File Review for dredge material disposal, 2000 – 2007 for federal projects and 2000 – 2006 for permitted projects, includes placement at designated disposal, sites, placement at upland sites, and placement at alternative disposal sites. Federal projects with no disposal between 2000 and 2007 not included in this table.

(2) Designated disposal sites include: SF-8/Ocean Beach, SF-9, SF-10, SF-11, SF-16, and the Deep Ocean Disposal Site (DODS). See Section 3.1 for a description of the designated disposal sites.

(3) Material available for placement at the HWRP site must meet the sediment quality requirements of the RWQCB and the Biological Opinion issued by the USFWS for the HWRP (see below, for further discussion in this section).

Table 2-3. Design Dimensions, Habitat Disturbance, and Dredging Volumes for the Proposed ATF and Alternatives

				Acres of Habitat Disturbed[1]							
Channel Section	**Existing Condition**	**Proposed Condition**	**Design Class**	**Subtidal**	**Mudflats**	**Tidal Marsh**	**Uplands**	**Total**	**Initial Excavation Volume (cy)**	**Average Annual Maintenance Dredging Volume (cy)**	**Annual Operational Transfer of Dredge Material (cy)**
ALTERNATIVE 1: DREDGED MATERIAL OFF-LOADER FACILITY (NO ACTION)											
Dredged Material Off-loader Facility	Deep Bay	1,000 x 300 ft (outside dimensions; facility overwater coverage is about 2.3 acres) Moored at -24 to -28 ft MLLW contour	Fully loaded scow (Up to 5,000 cy)	Negligible (piles)	—	—	—	Negligible	—	—	
Transfer Pipeline	Deep – shallow Bay	28,000 ft long, 30-inch steel pipeline sitting on concrete pads (impact area 3 ft wide)	N/A	2.1	0.1	—	—	2.2	Negligible	—	
Total Alternative 1				**2.1**	**0.1**	**—**	**—**	**2.2**	**Negligible**	**—**	
Transfer of Dredged Material to HWRP (Average Case)											*1,200,000*
Transfer of Dredged Material to HWRP (Maximum Case; operational capacity of off-loader)											*1,500,000*

Channel Section	Existing Condition	Proposed Condition	Design Class	Acres of Habitat Disturbed[1]					Initial Excavation Volume (cy)	Average Annual Maintenance Dredging Volume (cy)	Annual Operational Transfer of Dredge Material (cy)
				Subtidal	Mudflats	Tidal Marsh	Uplands	Total			
ALTERNATIVE 2: UNCONFINED IN-BAY ATF (PROPOSED ACTION)											
ATF Basin	Deep Bay	1,500 x 1,000 ft (34 acres) Excavated to -45 to -60 ft MLLW with 1:4 side slopes Min deposition thickness of 18 ft; Max filled design depth of –27 ft MLLW	Fully loaded hopper dredge (Up to 6,000 cy)	58[2]	—	—	—	58	1,600,000	280,000[3]	
Access Channel	Deep Bay	3,000 x 250 ft Excavated to -32 ft MLLW	Fully loaded hopper dredge (Up to 6,000 cy)	17	—	—	—	17	211,000	120,000[3]	
Transfer Pipeline	Deep – shallow Bay	28,000 ft long, 30-in steel pipeline sitting on concrete pads (impact area 3 ft wide)	N/A	2.1	0.1	—	—	2.2	Negligible	—	
Total Alternative 2				**77**	**0.1**	**—**	**—**	**77**	**1,811,000**	**400,000**	
Transfer of Dredged Material to ATF (Average Case)											*1,619,000*
Total Dredged Material Placed at HWRP, including maintenance dredging (Average Case)											*2,019,000*
Transfer of Dredged Material to ATF (Maximum Case; operational capacity of ATF Basin)											*3,625,000*
Total Dredged Material Placed at HWRP, including maintenance dredging (Maximum Case; operational capacity of ATF Basin)											*4,025,000*

Channel Section	Existing Condition	Proposed Condition	Design Class	Acres of Habitat Disturbed[1] Subtidal	Mudflats	Tidal Marsh	Uplands	Total	Initial Excavation Volume (cy)	Average Annual Maintenance Dredging Volume (cy)	Annual Operational Transfer of Dredge Material (cy)
ALTERNATIVE 3: CONFINED IN-BAY ATF											
ATF Basin	Deep Bay	1,500 x 1,000 ft (34 acres) Excavated to -45 to -60 ft MLLW with 1:4 side slopes Min deposition thickness of 18 ft; Max filled design depth of -27 ft MLLW Sheet Pile walls (4,300 feet)	Fully loaded hopper dredge (Up to 6,000 cy)	58[2]	—	—	—	58	1,600,000	280,000[3]	
Access Channel[5]	Deep Bay	3,000 x 250 ft Excavated to -32 ft MLLW	Fully loaded hopper dredge (Up to 6,000 cy)	17	—	—	—	17	211,000	120,000[3]	
Transfer Pipeline	Deep – shallow Bay	28,000 ft long, 30-in steel pipeline sitting on concrete pads (impact area 3 ft wide)	N/A	2.1	0.1	—	—	2.2	Negligible	—	
Total Alternative 3				**77**	**0.1**	**—**	**—**	**77**	**1,811,000**	**400,000**	
Transfer of Dredged Material to ATF (Average Case)											*1,619,000*
Total Dredged Material Placed at HWRP, including maintenance dredging (Average Case)											*2,019,000*
Transfer of Dredged Material to ATF (Maximum Case; operational capacity of ATF Basin)											*3,625,000*
Total Dredged Material Places at HWRP, including maintenance dredging (Maximum Case; operational capacity of ATF Basin)											*4,025,000*

Channel Section	Existing Condition	Proposed Condition	Design Class	Acres of Habitat Disturbed[1] Subtidal	Mudflats	Tidal Marsh	Uplands	Total	Initial Excavation Volume (cy)	Average Annual Maintenance Dredging Volume (cy)	Annual Operational Transfer of Dredge Material (cy)
ALTERNATIVE 4: DIRECT CHANNEL TO BMKV BASIN											
Direct Channel to Shore	Shallow Bay 0 to -11.5 ft MLLW	22,300 ft 180 ft wide -17 ft MLLW	Half-full 5,000 cy dump scow (12.1-ft half-full draft)	119–233[6]	4–10[6]	—	—	123–243[6]	1,992,000	415,000[3]	
BMKV Basin	Upland	1,500 x 1,000 ft (34 ac) Excavated to -27 to -32.5 ft MLLW with 1:3 side slopes Min deposition thickness of 13 ft; Max filled design depth of -14 ft MLLW	Half-full 5,000 cy dump scow (12.1-ft half-full draft)	—	—	—	44	44	1,680,000	25,000[3]	
Temporary Basin Levee	Upland	93 x 7,685 ft (714,705 sq ft) +10.5 MLLW with 1:3 side slopes (approx. 13 feet above existing grade) 15 ft crown width	N/A	—	—	—	16	16	200,000	—	
Total Alternative 4				**119–233[6]**	**4-10[6]**	**—**	**60**	**183-303[6]**	**3,872,000**	**440,000**	
Transfer of Dredged Material to BMKV Basin (Average Case)											*1,596,000*
Total Dredged Material Placed at HWRP, including maintenance dredging (Average Case)											*2,036,000*
Transfer of Dredged Material to BMKV Basin (Maximum Case; operational capacity of ATF Basin)											*3,585,000*
Total Dredged Material Placed at HWRP, including maintenance dredging (Maximum Case; operational capacity of ATF Basin)											*4,025,000*

				Acres of Habitat Disturbed[1]							
Channel Section	**Existing Condition**	**Proposed Condition**	**Design Class**	**Subtidal**	**Mudflats**	**Tidal Marsh**	**Uplands**	**Total**	**Initial Excavation Volume (cy)**	**Average Annual Maintenance Dredging Volume (cy)**	**Annual Operational Transfer of Dredge Material (cy)**
ALTERNATIVE 5: NOVATO CREEK CHANNEL TO BMKV-BASED ATF											
Petaluma River Across the Flats Channel	26,400 ft long 200 ft wide –11.5 ft MLLW	30,000 ft long 200 ft wide –17 ft MLLW	Half-full 5,000 CY dump scow (12.1-ft half-full draft)	45–149[6]	0-12[6]	—	—	45–161[6]	1,901,000	498,000[3]	
Passing Lanes (2)	N/A	3,800 ft & 3,700 ft long 100 ft wide	Half-full 5,000 CY dump scow (12.1-ft half-full draft)	Included in Petaluma River channel (above)							
Connection to Novato Creek Channel	3,000 ft long 40 ft wide –3 to –11.5 ft MLLW	3,000 ft long 208 ft wide –17 ft MLLW	Half-full 5,000 CY dump scow (12.1-ft half-full draft)	Included in Novato Creek channel (below)						Included in Petaluma Channel	
Novato Creek Channel	7,400 ft long 40 ft wide –4 ft MLLW	7,400 ft long 180 ft wide –17 ft MLLW	Half-full 5,000 CY dump scow (12.1-ft half-full draft)	26–71[6]	19–54[6]	12–41[6]	—	57–166[6]	1,687,000	Included in Petaluma channel	
BMKV Basin	Upland	1,500 ft x 1,000 ft (34 acres – active basin) Excavated to –27 to –32.5 feet MLLW with 3:1 side slopes Min deposition thickness of 13 feet; Max filled design depth of –14 feet MLLW	Half-full 5,000 CY dump scow (12.1-ft half-full draft)	—	—	—	44	44	1,680,000	25,000[3]	

				Acres of Habitat Disturbed[1]							
Channel Section	**Existing Condition**	**Proposed Condition**	**Design Class**	**Subtidal**	**Mudflats**	**Tidal Marsh**	**Uplands**	**Total**	**Initial Excavation Volume (cy)**	**Average Annual Maintenance Dredging Volume (cy)**	**Annual Operational Transfer of Dredge Material (cy)**
Temporary Basin Levee	Upland	+10.5 MLLW with 3:1 side slopes (approx 13 feet above existing grade) 15 ft crown width	N/A	—	—	—	16	16	206,000	—	
Total Alternative 5				**71–220**[6]	**19–66**[6]	**12–41**[6]	**60**	**162–387**[6]	**5,474,000**	**523,000**	
Transfer of Dredged Material to BMKV Basin (Average Case)											*1,336,000*
Total Dredged Material Placed at HWRP, including maintenance dredging (Average Case)											*1,859,000*
Transfer of Dredged Material to BMKV Basin (Maximum Case; operational capacity of ATF Basin)											*3,502,000*
Total Dredged Material Placed at HWRP, including maintenance dredging (Maximum Case; operational capacity of ATF Basin)											*4,025,000*

cy = cubic yards

ft = feet

MLLW = mean lower low water

1 Acres of habitat disturbed refers to habitat disturbance for construction, but also includes basin side slopes (Alt. 2, 3, 4, 5) and slumping of channels (Alt. 4, 5).

2 Includes the active footprint (1,500 feet by 1,000 feet, 34.4 acres) of the ATF basin and the inactive footprint of the side slopes (23.8 acres) for a total disturbance footprint of 58.2 acres

3 Average annual maintenance dredging for ATF and BMKV Basin includes basin infill only. Dredging for transferred material not included on this line.

4 Transferred material = delivered material total minus 5% assumed loss. No assumed loss for BMKV basin. Average for fully operational years only.

5 Need for an access channel for Alternative 3 will depend on ultimate location. If in relatively shallow water (such as -20 feet MLLW), an access channel of similar length to that for Alternative 2 would be necessary. If in relatively deeper water near the main shipping channel, then a much shorter access channel or perhaps no access channel would be necessary.

6 The smaller acreage equals the direct disturbance for dredging a channel with 1:3 side slopes. However, the side slopes will eventually slump to 1:15, and the higher acreage equals the ultimate 1:15 side slopes.

Source: Moffatt & Nichol (Appendix B).

199

2.2.1.2 Environmental and Safety Measures

Several measures would be implemented under all four Tier 1 alternatives (Alternatives 1 through 4) to ensure appropriate environmental protection and site safety during construction and operation:

- A **Site Safety and Health Plan** will be developed that would identify measures to ensure safety and health, as well as emergency response protocols.
- An **Environmental Protection Plan** will be developed that would include measures to address known or potential environmental issues that the contractor may face. The plan will include measures for erosion and sediment control; chemical management; spill control; noise control; odor control; contaminant prevention; wastewater management; measures for historic, archeological, and cultural resources; biological resources; and training of contractor personnel.
- **Emissions controls**. As described in the General Conformity analysis (see Appendix G), emissions controls will likely be required to ensure that project emissions will not exceed the conformity thresholds in any given year.

  Monitoring. The USACE and the Conservancy will e-evaluate emissions estimates annually based on the specific project-related activities that are scheduled for that year, and monitor emissions from all equipment to ensure that total project emissions do not exceed the de minimis thresholds. Emissions from operations will be estimated based on actual equipment fuel use.

  Criteria Pollutants Emission Control Measures. One or more of the following options will be implemented to ensure annual emissions do not exceed de minimis thresholds for any given calendar year:

  1. Option A: Schedule project activities so that annual emissions will not exceed the de minimis threshold.
  2. Option B: Apply appropriated diesel emission control strategies that have been verified by the California Air Resources Board (CARB) to reduce PM10 and NOX emissions generated from construction or operations of the ATF basin. These technologies include, but are not limited to, selective catalytic reduction (SCR), exhaust gas recirculation and use of alternative fuels. The most likely verified emissions control strategy to be applied to the dredging equipment is SCR.
  3. Option C: Electrify all dredging equipment and booster pump(s) that will be used for constructing and operating the ATF.

  Fleet Modernization for Equipment at HWRP. Construction equipment used onshore at the HWRP shall adhere to the following requirements:

  1. Construction equipment shall incorporate, where feasible, emissions savings technology such as hybrid drives and specific fuel economy standards.
  2. Idling, for all engines, shall be restricted to a maximum of 5 minutes when not in use.

  The following emissions standards shall be met:

  1. All off-road and stationary diesel-powered construction equipment greater than 50 horsepower (hp) shall, at a minimum, meet Tier 2 nonroad emission standards.

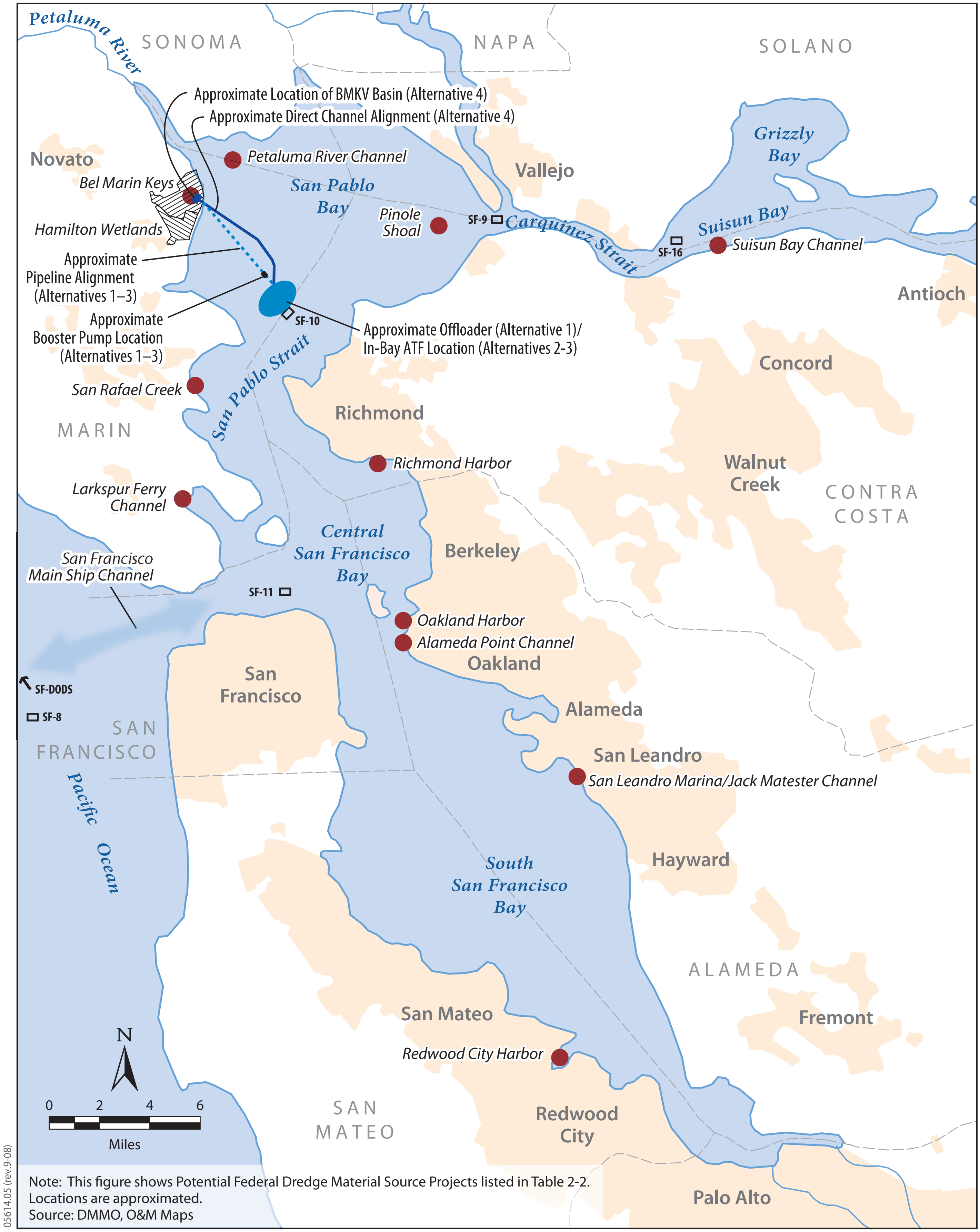

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Figure 2-1
Potential Federal Dredged Material Source Projects

2. All construction equipment shall be outfitted with Best Available Control Technology (BACT) devices certified by CARB.

3. Any emissions-control device used by the Contractor shall achieve emissions reductions no less than what could be achieved by a Level 2 or Level 3 diesel emission control strategy for a similar sized engine as defined by CARB regulations.

4. A copy of each unit's certified Tier specification, BACT documentation, and each unit's CARB or Bay Area Air Quality Management District (BAAQMD) operating permit, shall be provided at the time of mobilization of each applicable unit of equipment.

5. The above "Tier Specifications" measures shall be met, unless one of the following circumstances exists and the contractor is able to provide proof that any of these circumstances exists:

6. A piece of specialized equipment is unavailable in a controlled form within the State of California, including through a leasing agreement.

7. A contractor has applied for necessary incentive funds to put controls on a piece of uncontrolled equipment planned for use on the project, but the application is not yet approved, or the application has been approved but funds are not yet available.

8. A contractor has ordered a control device for a piece of equipment planned for use on the project, or the contractor has ordered a new piece of controlled equipment to replace the uncontrolled equipment, but that order has not been completed by the manufacturer or dealer. In addition, for this exemption to apply, the contractor must attempt to least controlled equipment to avoid using uncontrolled equipment, but no dealer within 200 miles of the project has the controlled equipment available for lease.

- To ensure compliance with **Basin Plan standards**, water quality (turbidity) testing will occur when turbidity-generating activities occur during project construction and operation.
- Facilities will comply with all **U.S. Coast Guard navigational safety regulations** pertaining to the lighting and signaling devices required for the off-loader facility and other alternative features (e.g., booster pumps, sheet piles). In addition, a Notice to Mariners would be filed with the local Marine Safety Office.

In addition to the measures described above, for all action alternatives (Alternatives 2 through 4) the following environmental and safety measures will be implemented.

- During the design phase and prior to final site selection **site specific geotechnical investigations, laboratory testing, and environmental sediment sampling and testing** will be conducted. Any findings that are contrary to the assumptions and expectations described in this SEIS/EIR will be appropriately addressed.
- **Green Sturgeon Monitoring.** The LTMS agencies are conducting green sturgeon tagging studies to develop an understanding of the spatial and temporal distribution and movement of green sturgeon in San Francisco Bay. As part of the proposed project, USACE will consult and coordinate with NOAA Fisheries prior to construction and operation of any action alternative to install acoustic monitors in the general area of the ATF basin and for any potential effects on green sturgeon. Should the tagging studies indicate that green sturgeon are attracted to the site, USACE will develop measures in consultation with NOAA Fisheries to further reduce any potential impacts on green sturgeon.

2.2.1.3 Dredged Material Quality Requirements

The quality of dredged materials placed in waters of the U.S. and for beneficial use in restoring wetlands is governed by various federal and state requirements (see Appendix C).

The U.S. Fish and Wildlife Service (USFWS) and the Regional Water Quality Control Board (RWQCB) have specified dredged material quality requirements for dredged material placed at the HWRP site. As summarized in Table 2-4 below, the USFWS requirements are in some cases more stringent than the RWQCB requirements. To obtain appropriate dredge material placement permitting, the most stringent criteria for any particular constituent applies. These requirements (or any future updates to them) will apply to all dredged material proposed for placement at the HWRP site, including material transferred through an off-loader or ATF, or material dredged to support the proposed ATF or BMKV basins or access channels. Permits from the USFWS and RWQCB have not yet been issued for the BMKV portion of the HWRP; however as part of the HWRP, it is expected that the requirements will also be applied to dredged materials placement at the BMKV site.

Table 2-4. Dredged Material Quality Permit Requirements for Hamilton Wetlands Restoration Project

Analyte	USFWS Biological Opinion for HWRP	RWQCB WDR R2-2005-0034
METALS (mg/kg)		
Arsenic	15.3	15.3
Barium	190	
Beryllium	1.03	
Boron	36.9	
Cadmium	0.7	1.2
Chromium	112	112
Cobalt	27.6	
Copper	68.1	68.1
Lead	43.2	43.2
Manganese	943	
Mercury	0.43	0.43
Nickel	112	112
Selenium	0.64	0.64
Silver	0.58	0.58
Vanadium	118	
Zinc	158	158
ORGANIC COMPOUNDS (μg/l)		
PAHs, total	3.39	3.39
Pentaclorophenol	0.017	
Phenol	0.130	
TPH-diesel/motor oil	144	
TPH-gasoline/JP-4	12	
BHCs, total	0.00099	

Analyte	USFWS Biological Opinion for HWRP	RWQCB WDR R2-2005-0034
Chlordanes, sum	0.0011	0.0023
DDTS, sum	0.007	0.007
Dieldrin	0.00072	0.00072
Endrin Aldehyde	0.0064	
Heptachlor	0.0003	
Heptachlor epoxide	0.0003	
Methoxychlor	0.09	
PCBs, sum	0.0227	0.0227
Dioxins (total TCDD TEQ)	0.00002	

Note: Several analytes, including Dichlorprop, MCPA, and MCPP were initially included as dredge material quality permit requirements in the USFWS Biological Opinion for the HWRP, but were subsequently removed as result of consultation between USACE and USFWS.

2.2.1.4 Dredge Material Operating Equipment

Dredging equipment that would be used for construction and operation of the proposed action or alternatives include a hydraulic cutterhead dredge, mechanical clamshell dredge, dump scow/tow combination, and hopper dredges (hopper dredges would only be used if either Alternative 2 or 3 is chosen; use of a hopper dredge with an off-loader facility (Alternative 1) is considered infeasible; the draft of the direct channel (Alternative 4) would not be deep enough to accommodate a hopper dredge. Dredging equipment may be used in any combination, and project specifics such as water depth, type of material to be dredged, and transport distance often dictate which type of vessel is most appropriate.

Cutterhead Dredges

Hydraulic pipeline cutterhead dredges (cutterhead dredges) are considered to be the most adaptable and efficient class of dredges, as well as being the most commonly used (USACE 1983). Cutterhead dredges vary widely in operational capacity and size, as manufacturers are able to incorporate any desired pipeline width and power source. The common components of these dredges include a ladder, rotating cutter, suction pipe, cutter motor, hull, lever room, main dredge pump and engine vessel, and pipeline (discharge line) (USACE 2006). The cutterhead dredge functions to excavate and move material hydraulically to remote locations without rehandling. The size of the cutterhead depends on the size of the discharge pipeline; generally, cutterheads range from 16 to 36 inches (about 40 to 91 centimeters [cm]). Cutterhead dredges remove and transport sediment in liquid slurry form (generally a ratio of 80% water and 20% sediment). They are usually barge-mounted and carry diesel or electric-powered centrifugal pumps with discharge pipes ranging in diameter from 6 to 48 inches (about 15 to 122 cm). The pump produces a vacuum on its intake side, which forces water and sediments through the suction pipe. The slurry is then transported by a pipeline or barge to the placement area.

The cutterhead itself is not a necessary component of the pipeline dredge; its function is to loosen densely packed deposits. Without it, the cutterhead dredge is effectually a plain suction (pipeline) dredge. However, it is common practice to use the cutterhead whether or not the deposits are hard packed (USACE 1983). Material dredged by cutterhead dredges can be pumped up to 3 miles ([mi]

about 5 kilometers [km]) along the typical length of pipeline using the primary dredge pump, although distances of up to 15 mi (about 24 km) can be achieved with the use of multiple booster pumps and pipeline. Dredge and booster pumps used in the cutterhead dredge may be either diesel- or electric-powered. In general, cutterhead dredges are not self-propelled and require the use of towboats to move the apparatus between dredging locations (USACE 1983).

Hopper Dredges

Hopper dredges are sea going vessels designed to dredge *and* transport material from navigation channels to open water placement areas. Hopper dredges are equipped with a drag arm on each side of the dredge. The drag arms are long suction pipes with drag heads attached to their ends. During active dredging, the drag arms are lowered into the water column until the drag heads are on the channel bottom, next the suction is turned on and the drag heads are slowly dragged across the shoaled material by the forward motion of the vessel. Sediment and water slurry is drawn up through the drag heads and drag arms by on-board pumps and deposited within the hopper bin located in the vessel's midsection. When the hopper bin is full, the dredge raises the drag arms, navigates to a designated dredged material placement area, and empties the dredged material through large doors located at the bottom of the dredge. Hopper dredges would be used to place dredged material in the San Pablo-based ATF basin under Alternatives 2 and 3 only.

Mechanical Clamshell Dredges

Clamshell dredges (also known as bucket dredges) are mechanical excavators that use a bucket attached to a crane with cables. The dredge operates by lifting the bucket (clamshell), dropping it into the bottom sediments, closing the jaws, then lifting the bucket full of dredged material to the surface and emptying the dredged material into a nearby disposal facility or dump scow for transportation to a dredged material placement facility (USACE 2006). Clamshell dredges are capable of removing hard and compacted bottom sediments. Generally, they are situated on flat barges that require towing to dredge sites. The main power supply to the dredge is from a diesel engine.

Tug Boats

Tug boats are necessary to move the nonmobile dredges and dump scows to and from the dredging and dredged material placement sites. Tug boats used for San Francisco Bay dredging operate by towing or pushing vessels using powerful diesel engines that typically produce 750 to 3,000 horsepower (hp).

Scows

Scows, or dump scows, are flat bottomed boats that are used to haul bulk dredged material. Scow vessels in the Bay can range in capacity from 250 cy up to 7,000 cy. Most of these transport vessels are not self-propelled and require the use of tug boats for transport. Dump scows can either dump materials directly from the bottom of the scow or have materials pumped out of the scow.

2.2.2 Alternative 1: Dredged Material Off-loader Facility (No Action)

Under Alternative 1, the dredged material off-loader facility would be used as described in the HWRP EIS/EIR and BMKV SEIS/EIR. Transport scows would be used to move material from the locations where dredging is taking place to the in-Bay off-loading facility. The off-loading facility would be located approximately 28,000 feet offshore from the HWRP site at approximately the -24 to -28-foot MLLW contour to enable large scows (5,000 cy capacity) to moor and off-load. An existing off-loading facility for the Port of Oakland -50-foot dredging project is currently located approximately 28,000 feet offshore from the HWRP site at approximately the -24 to -28-foot MLLW contour to enable large scows (5,000 cy capacity) to moor alongside the facility and off-load. This alternative includes continued use of the existing off-loading facility or construction and use of a similar facility at the same location. Additionally, any future off-loading facility could be replaced during the life of the project.

Alternative 1, consisting of the authorized off-loader facility and support barges, would have outside dimensions of approximately 1,000 feet long and 300 feet wide. While the facility would be approximately 1,000 feet long, it would only be up to 300 feet wide in a small portion of the facility; most of the facility would be 75 feet wide. Figure 2-2 shows a photograph of a similar dredged material off-loader facility. Equipment on the off-loading facility would include a hydraulic off-loader, attendant equipment and tool barge, three mooring barges, a cable reel barge, and a booster pump(s) on barges. The total overwater footprint of the off-loader facility, attendant barge, mooring platform and booster pumps would be 2.3 acres [ac] and the footprint of pipeline and related facilities would be approximately 2.2 ac. Alternative 1 would be designed to accommodate two dump scows moored simultaneously, with one dump scow being unloaded at any given time. Table 2-3 provides a comparison of Alternative 1 to the other four alternatives. All dredged material to be beneficially used at the HWRP site would be tested according to the dredged material permit requirements of the RWQCB and USFWS standards for the HWRP (see Table 2-4).

It is important to note that the off-loader facility currently transferring dredged materials from the Oakland Harbor -50 Foot deepening project to the HWRP site is a separate off-loader facility commissioned by the Port of Oakland. The authorized off-loader facility for the HWRP could be a separate, albeit similar, facility. The selection of the off-loader facility for the HWRP is currently being evaluated by USACE and Conservancy. The selection includes evaluation of costs, equipment availability and engineering challenges and opportunities.

Excavation and construction of Alternative 1 would result in the removal of existing substrate in San Pablo Bay. The off-loader facility would shade approximately 2.3 acres of San Pablo Bay, but disturbance of substrate would be limited to placement of piles and would be negligible in area. The total area of substrate to be disturbed during construction of the replacement pipeline and associated facilities is approximately 2.2 acres of subtidal and tidal mudflat substrate.

2.2.2.1 Dredged Material Delivery Facilities

Primary Delivery Pipeline

For Alternative 1 (as well as for Alternatives 2 and 3), water would be added to the dredged material via an auxiliary feedwater pump to create a slurry consisting of approximately 20% dredged material and 80% water by volume. A 20- to 30-inch–diameter high-density polyethylene (HDPE) or steel pipeline would be used to transport slurry from the off-loader facility to the restoration sites. The total maximum pipeline length would be approximately 26,000 to 28,000 feet from the transfer facility to the HWRP perimeter levee, including in-line booster pump(s) between the off-loader facility and the shoreline. The pipeline would be submerged and secured to the bottom by concrete anchors to reduce hazards to navigation and vulnerability to wind and wave action. The final routing of the pipeline would be determined during detailed design.

An existing length of pipeline was already constructed for use by the Port of Oakland's -50 Foot project. This pipeline—which is a 1,700-foot-long, 30-inch steel pipeline sitting on concrete pads—was built along an existing access road. However, due to the fact that it is currently being used for the Port of Oakland's -50 Foot project, it is possible that a new temporary pipeline would be needed for use with this Alternative. USACE and Conservancy are considering two options for the delivery pipeline: 1) a new pipeline that matches the existing alignment would be built to replace the existing pipeline once it has been corroded; or 2) a second pipeline may be needed adjacent to the existing pipeline if ATF construction overlaps with use of the Oakland -50 foot off-loader. Additionally, due to the coarse nature of the slurry being transported through the pipeline, the existing and/or new pipeline may also need to be replaced at least once during the project's lifetime. For the purposes of this analysis, it is assumed that the existing pipeline is replaced at the outset of the project, as well as after every 5 years of project operation. This assumption applies to this alternative and to Alternatives 2 and 3.

In-Line Booster Pump Facilities

One or more in-line booster pump facilities, consisting of a floating or jack-up booster pump barge, would be installed in designated locations along the primary delivery pipeline to enhance pumping capacity and facilitate delivery of the dredged material slurry to the restoration site. Alternative 1 assumes the use of either diesel or electricity for the booster pumps. The choice of which power source will depend on cost and what is necessary to ensure that the project emissions are under the conformity levels in any given year.

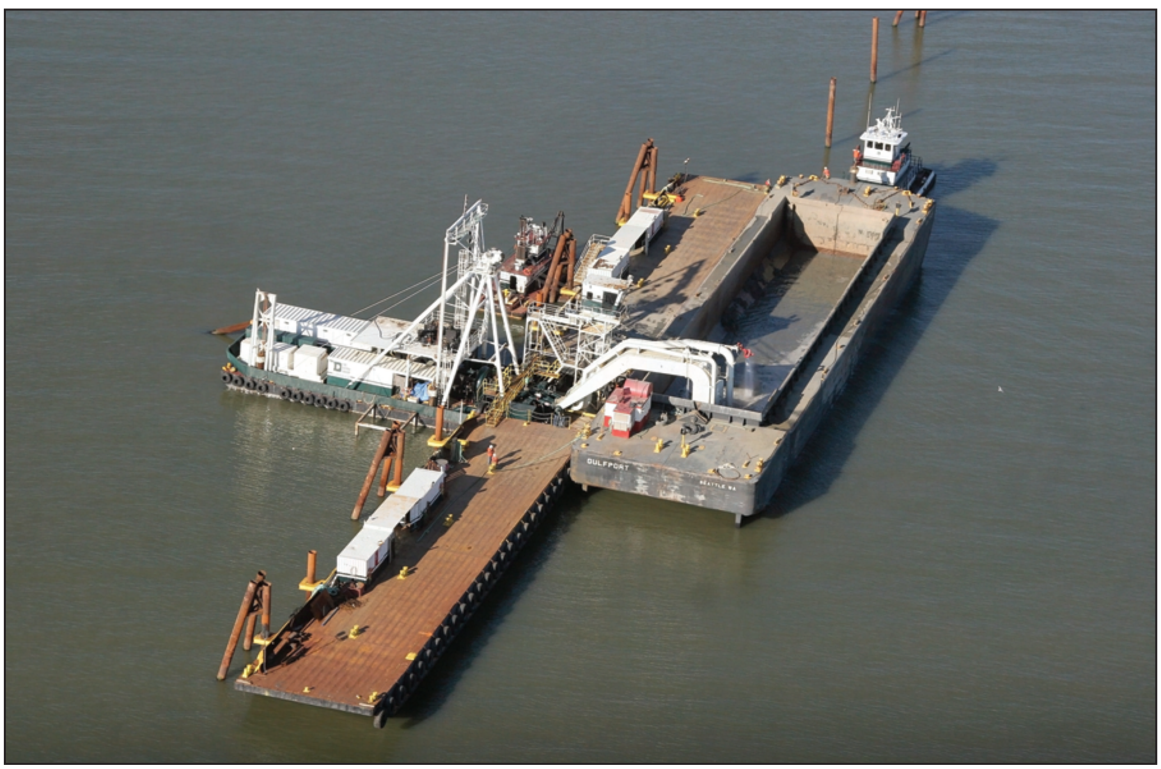
Depending on specific location and other factors such as wind and wave action, the platforms may be either pile-secured or floating. A booster pump might also be located along the shore segment of the pipeline. If pile-secured, approximately 4 piles (each 24 to 36 inches in diameter) would be needed for the booster platform. The booster platform may also be a jack-up barge supported by integral spuds within the booster barge.

If powered by electricity, the booster pump would use a submerged high-voltage power cable from shore. The routing for the power line is described below for the off-loader.

2.2.2.2 Off-loader facility

Alternative 1, consisting of an off-loader and support barges, would be approximately 1,000 feet long and 300 feet wide. The total overwater footprint of the off-loader, attendant barge, mooring platform would be approximately 2.3 ac. Equipment on the off-loading facility would include a hydraulic off-loader, attendant equipment and tool barge, three mooring barges, a cable reel barge, and booster pump(s) on barges.

Source: World Dredging, January 2002.



Source: Manson/Dutra Joint Venture, 2008.

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Figure 2-2
Examples of Dredged Material Off-loaders

The off-loader facility platform would be floating and secured to a perimeter three-pile dolphin system. Approximately 29 piles (each as large as 36 inches in diameter) would be needed for the off-loader facility platforms (if replaced).

Alternative 1 assumes the use of either diesel or electricity power for the off-loader. The choice of which power source will depend on cost and what is necessary to ensure that the project emissions are under the conformity levels in any given year.

The existing off-loader obtains power via a substation near the entrance to the BMKV property south of Bel Marin Keys Boulevard. From the substation, the electrical line proceeds across the BMKV parcel southeasterly to the existing N-1 levee where it then parallels the N-1 levee to the just short of the shoreline levee at San Pablo Bay. The line then turns southerly onto the HWRP to the point it meets the existing marsh crossing pipeline and then proceeds offshore to the existing off-loader following the transfer pipeline. If electrical power is used for the project off-loader, it is likely that the electrical power facilities would be the same as the current ones.

2.2.2.3 Operations and Maintenance

The off-loader could pump dredged material directly from the dredge scows to the HWRP site at a maximum rate of 2,000 cy/hour with 12.8 hour/day effective off-loading time (resulting in a potential maximum rate of 25,600 cy/day). However, this maximum rate does not consider booster pump inefficiencies, engagement and disengagement of a scow, line cleanout, and the predicted amount of dredged material to be delivered each month. The current off-loader is estimated to have a maximum capacity of approximately 1.5 mcy per year. Subtracting a 20% contingency from this maximum capacity to account for the above operational considerations, the average capacity assumed in this SEIS/EIR for the off-loader is 1.2 mcy per year.

The dredging work windows (described above) would apply to construction and dredging activities, but the operations of the off-loader facility, once built, are assumed to not be constrained by the work windows. Therefore, for the purposes of cost estimating, it is assumed that the off-loader facility operations would occur during the 6-month dredging work window, as well as 3 weeks immediately preceding and following the window, for a total of 7.5 months per year. Based on timing and volume of existing dredging operations in San Francisco Bay, the additional 6 weeks outside of the work window is believed to be necessary to allow for the maximum number of dredge projects to be able to access the off-loader facility. It is assumed that both federal and medium-sized dredging projects could be accommodated by the off-loader facility (see Table 2-2). Given the potential for operational constraints for dredging projects in the region, use of the off-loader facility effectively precludes the use of hopper dredges.

Alternative 1 could operate as much as 24 hours per day to fully support various dredging operations, during its operational period. However, while off-loading operations would not be restricted, placement of sand requires land-based equipment that may be restricted to day operations. The estimated number of off-loader facility workers is seven per shift. USACE estimates that there could be 0 to 8 scows operating per day with a daily average of 3 to 5 scows when dredged material source projects are actively dredging.

2.2.2.4 Facility Construction and Decommissioning

The major steps in mobilizing Alternative 1 and related support equipment would include the following:

1. Install pile dolphin system to secure off-loader facility.
2. Mobilize off-loader, deck and equipment barges, and booster pumps.
3. Mobilize and install floating, submerged, and shore pipeline (approximately 28,000 feet), if not retained from the Port of Oakland -50-foot project.
4. Procure and install submerged electrical cable, transformer, sub-station and cable barge.

The equipment used for mobilization would include a floating pile driver (impact hammer), derrick barge, 20-ton crane, large loader, tug boat, and work and crew boats. The projected work hours are estimated to be 12 to 24 hours per day. The estimated crew size is 12 to 18 persons per shift. Construction of the off-loader facility and associated facilities would take approximately 6 months.

Following completion of the HWRP, the off-loader facility would be decommissioned. This would involve removal of all structural elements, including transfer pipelines, deck and equipment, and electrical cable and power supply system. Decommissioning would require subsequent demobilization of the off-loader facility and removal of the anchor pile system. The decommissioning process is anticipated to take approximately 1 to 2 months.

2.2.2.5 Cost Estimate

The total cost estimate in 2007 dollars for Alternative 1 ranges between $302 million and $447 million based on the Moffat & Nichol report, included in Appendix B of this SEIS/EIR, which includes the detailed cost assumptions.

The low end of the cost estimate range ($302 million) corresponds to a scenario in which the project would be completed in 11 years. In order to complete the project in 11 years, the offloader would have to handle about 2 mcy annually every year. Based on current experience with the Port of Oakland offloader, the maximum operating capacity of an offloader is estimated to be 1.5 mcy and the average operating capacity is estimated to be only 1.2 mcy. These lower estimates of operating capacity were used in this SEIS/EIR as the basis of environmental analysis accordingly.

The high end of the cost estimate range ($447 million) corresponds to a scenario in which the project would be completed in 16-18 years, with an average transfer of 1.375 mcy annually which is between the estimated average annual and maximum operating capacity noted above. If the offloader only operates at the average annual operating capacity of 1.2 mcy, then costs would likely be higher than $447 million.

Detailed breakdown of the cost estimate developed by USACE (based on Shaw Environmental [2004] with outyear indexing by Moffatt & Nichol) is shown in Table 2-5. The cost estimates provided in this SEIS/EIR are not final, and are subject to revision during the project development process.

Table 2-5. Cost Estimates for Hamilton ATF Alternatives[1]

Alternative	Duration (yrs.)	Unit Cost (per cubic yard of dredged material placed at each Alternative site)	Total Cost (includes design, construction, and operation, and decommissioning)	Relative Contingency & Escalation[2]
1	11-16[3]	$13.39-19.79	$302M - $447 M	High
2	10	$5.25	$119 M	Low
3	10	$5.90	$132 M	Med
4	9	$10.28	$ 232 M	Med

[1] Costs represent planning level estimates. Detailed design estimates are currently underway.

[2] Contingencies are uncertainties in the underlying assumptions of the estimates, such as future energy costs labor rates, market conditions. Escalation accounts for anticipated future inflation of project costs, as such, project costs increase with the duration of the project implementation or construction. The escalated costs are based on an annual interest rate of 5%. Planning level cost estimates have a high rate of contingency. Contingencies and Escalations are presented here as a relative and qualitative manner to compare alternatives. Details are found in Appendix B.

[3] The preliminary cost estimate for Alternative 1 is based on a duration of 11 to 16 years. However, as noted above, Alternative 1 is expected to have a duration of up to 18 years; thus, the cost for Alternative 1 may vary from (and could exceed) the preliminary cost estimate.

Source: USACE 2007 (see Appendix B)

2.2.2.6 Outstanding Issues

1. Cost estimate for Alternative 1 does not account for replacement of the transfer pipeline every 5 years during the project lifetime.
2. Cost estimate does not include increased costs for decanting and pumping of increased volumes of process water as restoration sites near completion.
3. Cost estimate does not include additional costs to dredging projects due to reduced production, additional towing, standby, and downtime costs when off-loader causes delays or is unexpectedly non-operational.
4. Cost estimate does not include construction design, site preparation, plant propagation, permitting documents, relocation, real estate, and other project costs.
5. As noted above, the current cost estimate may not fully reflect the operational limitations of an offloader.

2.2.3 Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Under Alternative 2, the proposed ATF basin would be located in San Pablo Bay near SF-10 (see Figure 1-2). Dredge delivery vessels (scows and hopper dredges) would deposit material dredged from San Francisco Bay into the proposed ATF. Material placed in the ATF would then be re-dredged using a hydraulic cutterhead dredge and pumped to the HWRP site through a transfer pipeline. Similar to the authorized off-loader facility under Alternative 1, the proposed ATF would be located approximately 26,000 to 28,000 feet from the restoration site at approximately the -24 to -28-foot MLLW contour. However, unlike the authorized off-loader facility, Alternative 2 would allow large scows (5,000 cy capacity) and hopper dredges (6,000 cy capacity) to more efficiently place dredged material in the basin for beneficial use, without the need to moor alongside and off-load material as under Alternative 1. Figure 2-3 and 2-4 illustrate a conceptual schematic and cross-section of Alternative 2, respectively. An image of the hydraulic dredge cutterhead used to re-uptake dredged material from the proposed ATF basin is shown in Figure 2-5.

Assuming Alternative 2 were located in an area where water depth is less than -32 feet MLLW, construction of an access channel would be required to allow fully loaded scows and hopper dredges to enter the proposed ATF basin site. Annual channel maintenance dredging would also be required to allow uninterrupted passage of loaded vessels. Preliminary calculations suggest that the minimum channel width should be approximately 250 feet, with a minimum channel depth of -32 feet MLLW in smooth and soft bed material. Approximately 211,000 cy of material must be initially dredged from San Pablo Bay for construction of the access channel, along with 120,000 cy of annual maintenance dredging. All dredged material to be beneficially used at the HWRP site (including proposed ATF basin excavation and maintenance volumes) would be tested according to dredged material permit requirements outlined by the RWQCB and USFWS Biological Opinion standards for the HWRP (see Table 2-4). Those sediments containing constituents of concern that do not meet these requirements would be disposed of at other locations.

The precise location of the proposed ATF basin for this alternative has not been selected, although the general location is known with sufficient resolution to complete the environmental impact analysis.

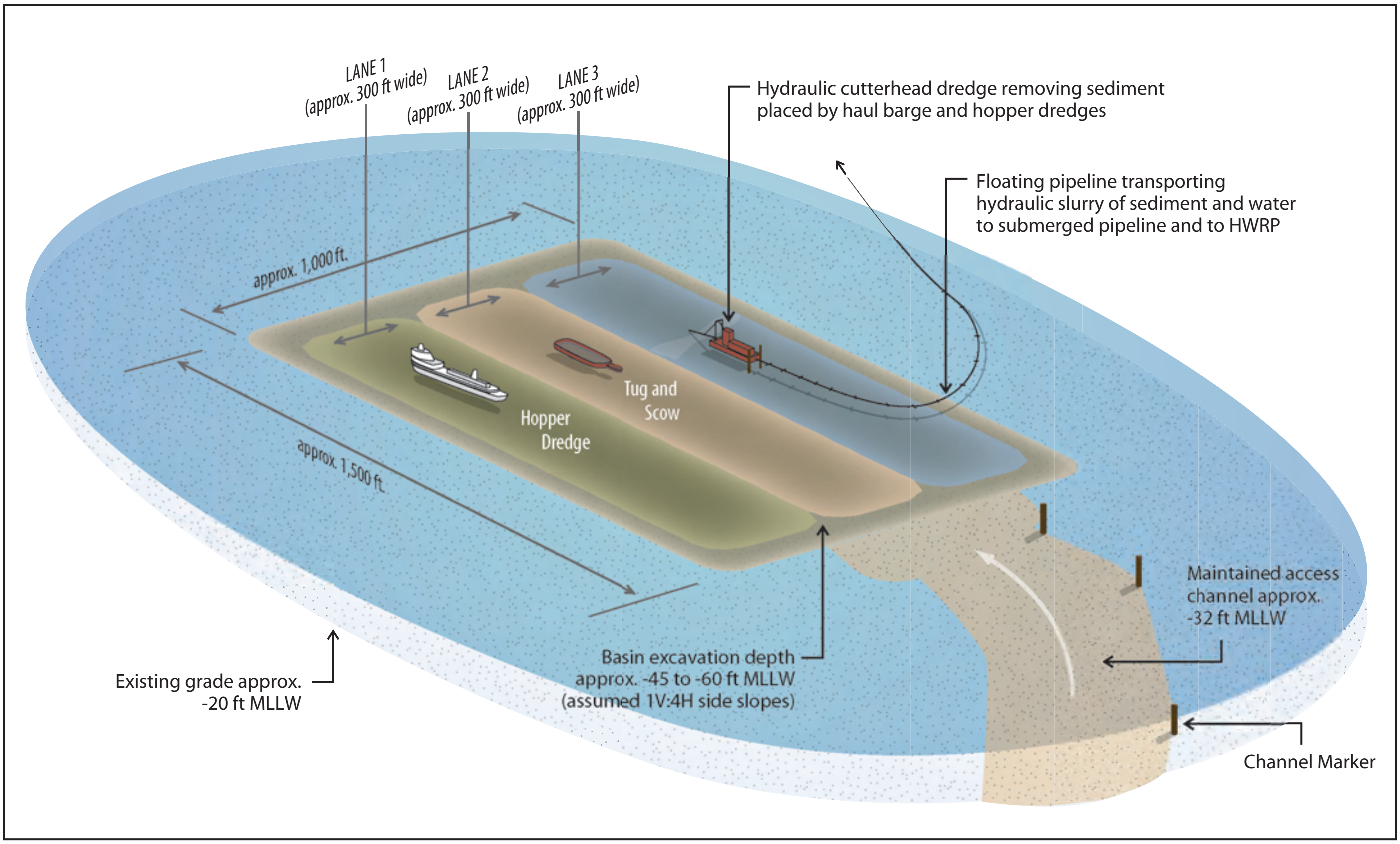

Figure 2-3
Alternative 2: Unconfined In-Bay ATF

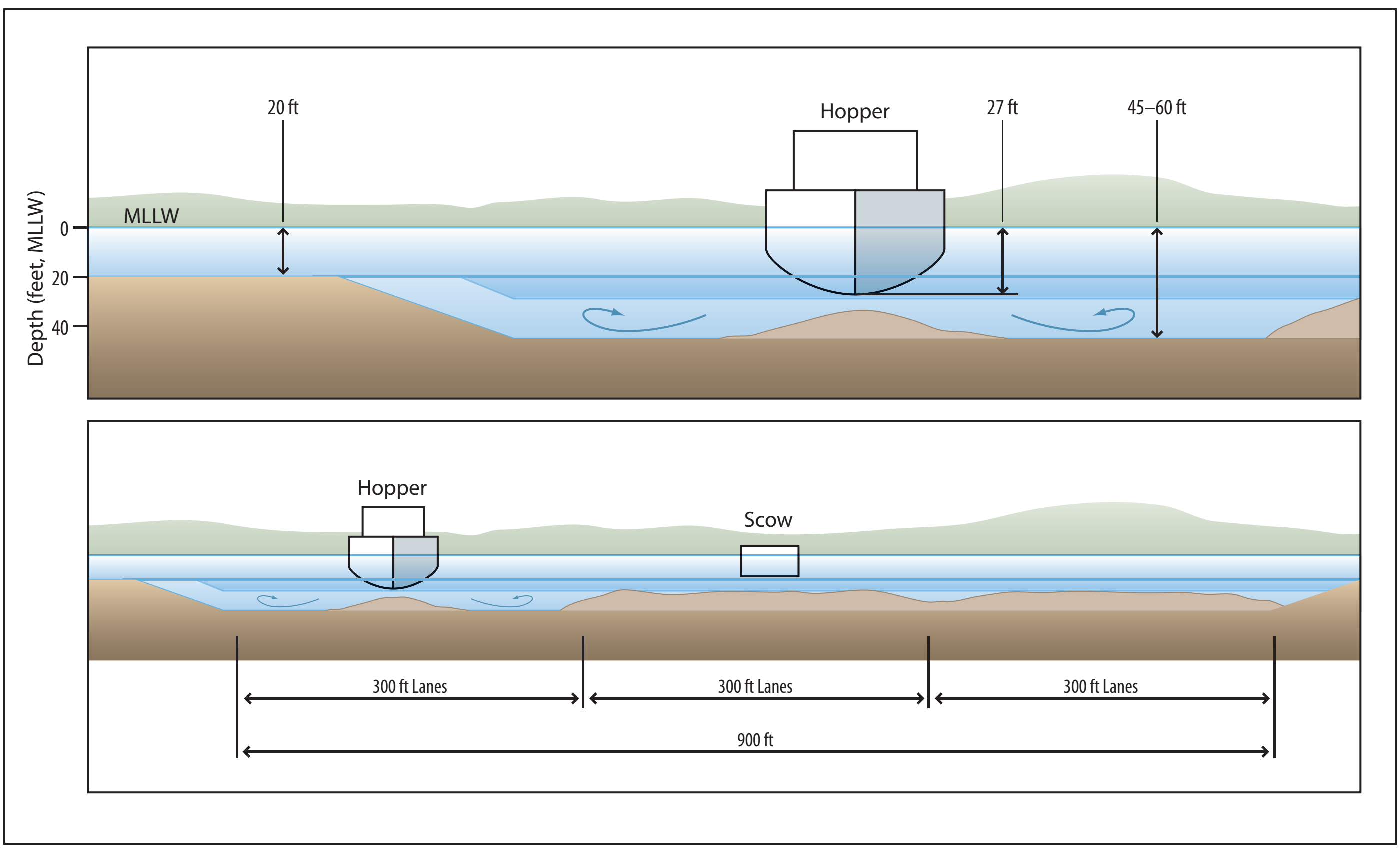

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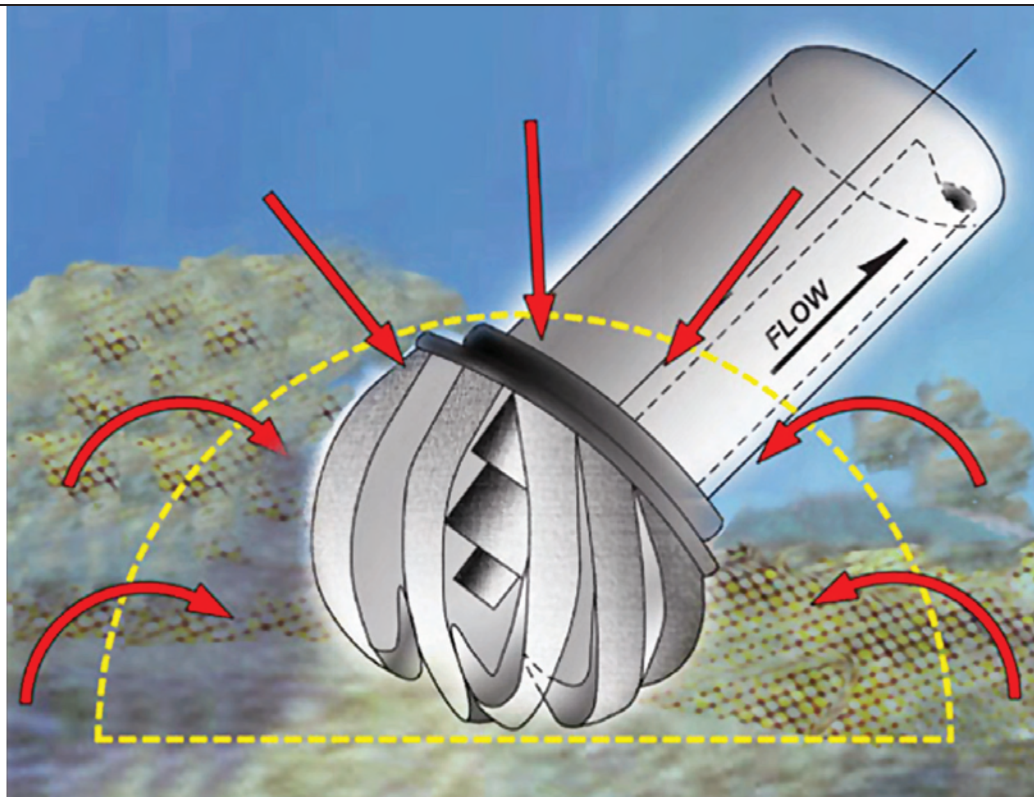
Figure 2-4
Cross Section of Unconfined In-Bay ATF



Source: USACE, 2008.

Figure 2-5
Hydraulic Cutterhead Dredge and Pipeline

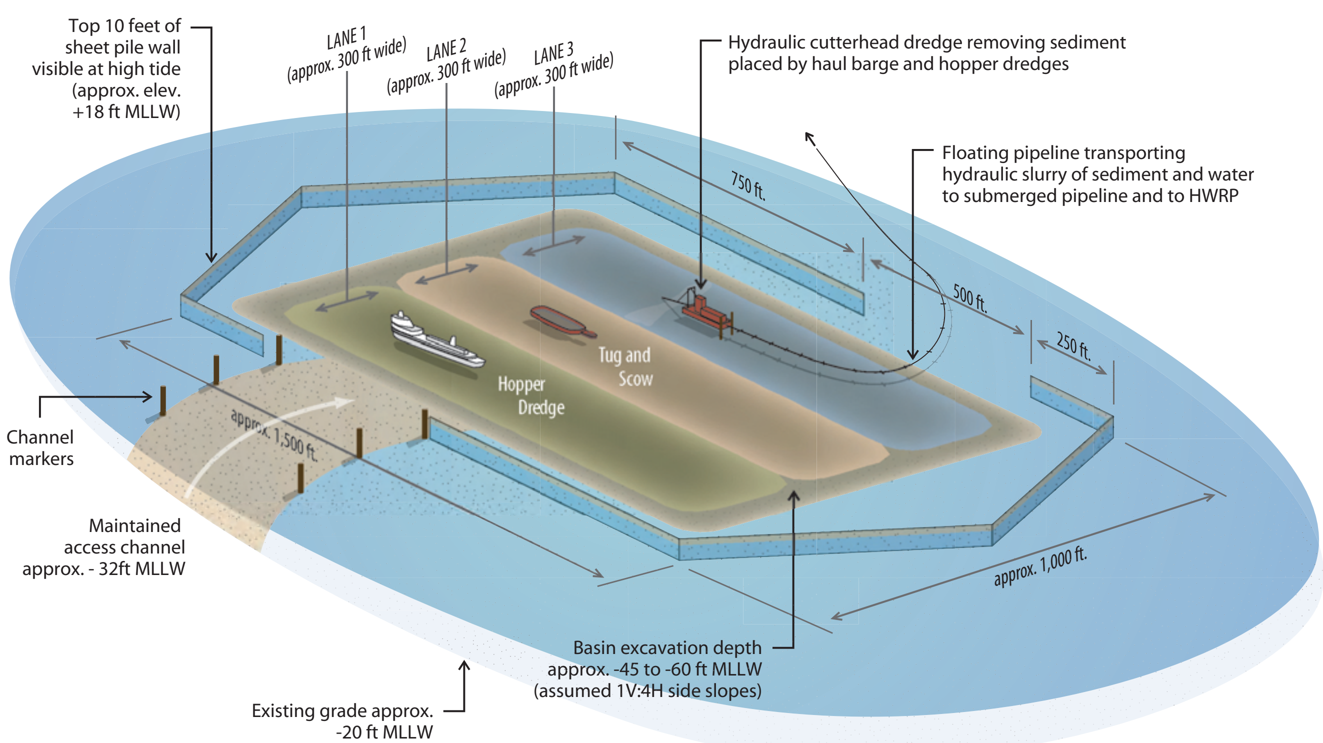


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Figure 2-6
Alternative 3: Confined In-Bay ATF

Locating the proposed ATF in deeper waters could avoid or minimize access channel length, whereas locating the proposed ATF in shallower waters would include greater amounts of maintenance dredging but would reduce the potential for material loss due to the lower current velocities in relatively shallower areas. Excavation and maintenance of an access channel involves a greater amount of environmental disturbance and was assumed under this alternative for the purpose of evaluating the maximum potential for environmental impacts. Table 2-3 provides a comparison of Alternative 2 to the other three alternatives.

Alternative 2 would require periodic onsite observation, monitoring, and management. Regular management activities would include routine hydrographic surveys, global positioning system (GPS) positioning of sediment placement, and radio/telephone contact for each load of dredged material placed at the site.

Excavation and construction of Alternative 2 would result in the removal of some existing shallow substrate in San Pablo Bay. The total area of substrate to be initially disturbed during excavation of the ATF basin (with 1V:4H side slopes) is 58 ac of deep bay. If constructed, an access channel would disturb approximately 17 ac of deep bay. The total area of substrate to be disturbed during construction of the replacement pipeline and associated facilities is approximately 2.2 acres of subtidal and tidal mudflat.

2.2.3.1 Dredged Material Delivery Facilities

Alternative 2 would also employ the primary delivery pipeline and in-line booster pump facilities described above for Alternative 1. Alternative 2 assumes the use of either diesel or electric power for the hydraulic cutterhead dredge and for the booster pumps. The choice of which power source will be used is dependent on costs and what is necessary to ensure that the project emissions are under the conformity levels in any given year.

The hydraulic cutterhead dredge used to empty the proposed ATF basin and transfer dredged materials to the HWRP site would be sized at 24- to 30-inches. The distance from the proposed ATF basin to the HWRP perimeter levee would be approximately 26,000 to 28,000 feet. The first 2,000 feet of the delivery pipeline located in and near the proposed ATF basin would be a floating line to allow the dredge to work anywhere within the basin footprint. The remaining 24,000 to 26,000 feet of line would be a submerged pipeline. Electrical power would be extended to the booster pumps if electricity is selected for this project element. The alignment for this power would be similar to the existing electrical facilities which are used at the authorized off-loader.

2.2.3.2 In-Bay ATF Basin

For Alternative 2, the proposed ATF basin would measure approximately 1,000 feet by 1,500 feet, with an active footprint of approximately 34 acres and side slopes of 24 acres, for a total area of 58 acres. From an average bottom depth of -20 feet MLLW, the basin would be excavated to a depth of approximately -45 to -60 feet MLLW, with assumed 1V:4H side slopes (1 foot vertical to 4 feet horizontal).

The finished dimensions of the proposed ATF basin would allow placement of approximately 240,000 cy of sandy sediment (which mounds) or 300,000 cy of fine-grained sediment per lane, (which would result in 720,000 cy of sandy sediment, or 900,000 cy of fine-grained sediment at full capacity). The basin design would provide for a maximum filled design depth of -27 feet MLLW (presuming a bottom depth of -45 feet and a fill depth of 18 feet).

Initial dredging of the proposed ATF basin would remove approximately 1.6 mcy of sediment, which would be transferred to the HWRP site for beneficial use according to RWQCB and USFWS dredged material permit requirements.

Alternative 2 would include three 300-foot-wide lanes for use by barges, scows, and hopper dredges. This minimum channel width would meet the basic requirements of vessel safety, simultaneous dredging and placement activities, and segregation of sediment types. Operation of the basin would coordinate material type placement (segregated by lane) according to wetland construction sequencing.

2.2.3.3 Operations and Maintenance

Annual basin infill via currents, combined with deposited sediment lost via currents, is anticipated to accumulate approximately 280,000 cy of additional material in the basin annually. Annual maintenance dredging of the access channel would add 120,000 cy, which would also be placed in the proposed ATF basin. Average annual dredged material delivered to the proposed ATF basin from dredging projects is estimated as 1.6 mcy. When combined with the basin infill and the maintenance channel dredged material, an estimated 2.0 mcy would be dredged from the basin and transferred to the HWRP site annually.

Because the total capacity of the proposed ATF basin at any one time is less than 1.6 mcy, it is anticipated to be emptied more than once per year. Considering this limit, the maximum annual operational capacity of the basin is estimated as 4.0 mcy. Therefore, the maximum amount of dredged material that could be delivered to the proposed ATF basin from dredging projects annually is estimated as be 3.6 mcy when accounting for the 400,000 cy of basin infill and access channel dredged material.

For both Alternatives 2 and 3, USACE is anticipating a 12-month placement window for the ATF facility with a majority of deliveries occurring within the standard environmental work windows. Placement of dredged material into the proposed ATF basin and transfer of dredged material to the HWRP site could occur simultaneously. Dredged materials placed in the proposed ATF would be transferred hydraulically to the HWRP site using a 20- to 30-inch cutterhead dredge and delivery pipelines. For Alternative 2, the cutterhead dredge would be mobilized and de-mobilized each year at the beginning and end of the work window with possible interim mobilization/demobilization depending on dredged material deliveries.

Three primary vessel types are expected to operate within the transfer facility, including trailing suction hopper dredges, cutterhead dredges, and tug and dump scow combinations. The cutterhead dredge is not a self-powered vessel and would require tug assist for movement into, out of, and within the proposed ATF basin.

Alternative 2 could operate for receipt of dredged sediment 24 hours per day; however placement of sand at the HWRP site requires land-based equipment, which, may be restricted of capacity from night work. Because the proposed ATF basin could accommodate smaller scows (500 to 2,000 cy), the estimated number of scows (or hopper dredges) used per day could be higher under Alternative 2 than for the off-loader facility. For planning purposes, USACE estimates that there could be 0 to 40 vessels operating per day, with a daily average of 8 to 12 scows operating when dredged material source projects are actively dredging; days with more than 20 vessels operating are expected to be very rare.

2.2.3.4 Facility Construction and Decommissioning

The major steps in construction for Alternative 2 would include the following:

1. Mobilize and install approximately 28,000 feet of pipeline and booster pump, if not retained from the Port of Oakland -50-foot project.
2. Procure and install submerged electrical cable if not retained from the Port of Oakland -50-foot project and if dredging is required to be electrically powered.
3. Excavate ATF basin to required dimensions and transfer material to HWRP (if materials meet the RWQCB and USFWS dredged material permit requirements for HWRP).
4. Excavate access channel (if necessary) and transfer material to HWRP (if it meets dredged material permit requirements of the RWQCB and the Biological Opinion issued by the USFWS for the HWRP).

The construction approach for Alternative 2 would be to build the transfer pipeline and booster pump first, followed by the proposed ATF basin and then the access channel (if needed). This sequencing will allow transfer of excavated basin material to the HWRP site. Work windows would be negotiated through agency consultation. It would take approximately 2 to 3 months to excavate the in-Bay ATF basin, depending on the size of the dredge that is used.

Decommissioning the proposed ATF could be accomplished by placing clean dredged material into the ATF basin until it reaches pre-construction grade, allowing the basin to fill by natural shoaling, or a combination of both.

2.2.3.5 Cost Estimate

The total cost estimate in 2007 dollars for construction and operation of the Unconfined In-Bay ATF is $119 million. This cost estimate is approximately $183 to $328 million less than the authorized off-loader facility in Alternative 1. Detailed breakdown of the cost estimate developed by USACE (based on Shaw Environmental [2004] with outyear indexing by Moffatt & Nichol) is shown in Table 2-5. Cost assumptions (including escalation) are further detailed in the Moffat & Nichol report, included in Appendix B of this SEIS/EIR. The cost estimates provided in this SEIS/EIR are not final, and are subject to revision during the project development process.

The following are outstanding cost estimate issues:

1. Cost estimate does not account for replacement of the transfer pipeline every 5 years during the project lifetime.
2. Cost estimate assumes use of diesel only for hydraulic dredge and booster pumps. Increased costs would result if the project would exceed the General Conformity *de minimus* thresholds with use of diesel fuel and either additional diesel control technology or use of electricity is deemed necessary.

3. ATF construction and maintenance dredged material is currently being tested. Some of the material may not meet the HWRP dredged material quality requirements (see Table 2-4). Cost estimate does not account for any offsite disposal of any unsuitable material.
4. Cost estimate does not include construction design, site preparation, permitting documents, relocation, real estate, and other project costs.

2.2.4 Alternative 3: Confined In-Bay ATF

A conceptual schematic of Alternative 3 is shown in Figure 2-6 earlier in the chapter. This alternative would be similar to the proposed ATF in Alternative 2, except that under Alternative 3, the ATF basin would incorporate a structural enclosure to isolate dredged material from surrounding waters. The enclosure would be constructed with a sheet pile wall installed along its perimeter, thereby creating a confined basin. Approximately 4,300 linear feet of steel sheet piles would be erected around the confined ATF, with two 500-foot-wide openings for vessel access offset to minimize currents through the facility. The top 10 feet of the enclosure surrounding the confined ATF would be visible at high tide (approximate elevation +18 MLLW); the top 18 feet of the enclosure would be visible at low tide.

The dredged material placed in Alternative 3 would be protected from wind, wave, tidal, and current energies by the sheet pile walls. Because this enclosure protects delivered sediments from transport outside of the ATF basin, it enables the facility to be located in deeper water; however, for the purposes of this analysis, an access channel is assumed to be required. All dredged material to be beneficially used at the HWRP site—including ATF excavation and maintenance volumes—would be tested according to dredged material permit requirements outlined by the RWQCB and USFWS BO standards for the HWRP (see Table 2-4). Table 2-3 provides a comparison of Alternative 3 to the other three alternatives.

The sheet pile structure would be inspected regularly to monitor its structural stability. The inspection would include survey of the structure to ensure no significant displacement has occurred, examination and replacement of cathodic protection, and assessment of the perimeter for scour or shoaling adjacent to sheet piles.

2.2.4.1 Dredged Material Delivery Facilities

Alternative 3 would also employ the primary delivery pipeline and in-line booster pump facilities described above under Alternative 2. Alternative 3 assumes the use of either diesel or electric power for the hydraulic cutterhead dredge and for the booster pumps. The choice of which power source will be used is dependent on costs and which source would ensure that the project emissions are under the conformity levels in any given year.

A 20- to 32-inch hydraulic cutterhead dredge would be used to empty the proposed ATF basin and transfer materials to the HWRP site. The distance from the proposed ATF basin to the HWRP perimeter levee would be approximately 26,000 to 28,000 feet. The first 2,000 feet of the delivery pipeline, located in and near the proposed ATF basin, would be a floating line to allow the dredge to work anywhere within the footprint of the basin. The remaining line would be a submerged pipeline.

2.2.4.2 In-Bay ATF Basin

Alternative 3 would also employ an excavated in-Bay ATF basin as described under Alternative 2 above. However, a steel sheet pile confinement would surround the basin. Excavated material would be transferred to the HWRP site for beneficial use if the dredged material meets RWQCB and USFWS BO permit requirements for the HWRP (see Table 2-4).

2.2.4.3 Operations and Maintenance

Operation and maintenance procedures under Alternative 3 would be the same as those described for Alternative 2 above, except that all work would occur within the sheet pile confinement.

Average annual dredged material delivered to the proposed ATF basin under Alternative 3 from dredging projects is estimated to be 1.6 mcy. When combined with the basin infill and the maintenance channel dredged material, an estimated 2.0 mcy would be dredged from the basin and transferred to the HWRP site annually. The maximum annual operational capacity of the basin is estimated to be 4.0 mcy. The maximum amount of dredged material that could be delivered to the proposed ATF basin from dredging projects annually is estimated to be 3.6 mcy when accounting for the 400,000 cy of basin infill and access channel dredged material.

2.2.4.4 Facility Construction and Decommissioning

The major steps in construction for Alternative 3 would include the following:

1. Mobilize and install perimeter sheet piles around specified ATF configuration. Batter piles and/or H piles would also need to be installed possibly every 20 feet.
2. Mobilize and install approximately 28,000 feet of pipeline and booster pump, if not retained from the Port of Oakland -50-foot project.
3. Procure and install submerged electrical cable if not retained from the Port of Oakland -50-foot project and if dredging is required to be electrically powered.
4. Excavate ATF basin to required dimensions and transfer material to HWRP (if materials meet the RWQCB and USFWS dredged material permit requirements for HWRP).
5. Excavate access channel (if necessary) and transfer material to HWRP (if materials meet the RWQCB and USFWS dredged material permit requirements for HWRP).

The construction approach for Alternative 3 would be to install the perimeter sheet piles for the proposed ATF basin first, then build the replacement pipeline and booster pump, and finally excavate the ATF basin. This sequencing will allow transfer of excavated basin material to the HWRP site. It would take approximately 2 to 3 months to excavate the basin, depending on the size of the dredge.

The sheet pile installation would require a vibratory hammer to drive piles, and an impact hammer may be needed for the batter piles. It is estimated that 16 sheet piles per day could be driven in order to construct the confinement. Construction of the sheet pile enclosure and basin dredging, together, could be accomplished in 6 to 8 months.

Decommissioning the in-Bay ATF basin could be accomplished by placing clean dredged material into the ATF until restoration to pre-construction grade, allowing the basin to fill by natural shoaling, or a combination of filling with dredged material and natural shoaling. Deconstruction of Alternative 3 would also require removal of the sheet pile structure. Sheet piles are typically vibrated out with a vibratory hammer that may include the possible use of jetting if piles were to become stuck.

2.2.4.5 Cost Estimate

The cost estimate for construction and operation of Alternative 3 is $132 million. This cost estimate is approximately $170 to $315 million less than the authorized off-loader facility in Alternative 1, but $13 million greater than the proposed ATF in Alternative 2. Detailed breakdown of the cost estimate developed by USACE (based on Shaw Environmental [2004] with outyear indexing by Moffatt & Nichol) is shown in Table 2-5. Cost assumptions (including escalation) are further detailed in the Moffat & Nichol report, included in Appendix B of this SEIS/EIR. The cost estimates provided in this SEIS/EIR are not final, and are subject to revision during this project development process.

The following are outstanding cost estimate issues:

1. Cost estimate does not account for replacement of the transfer pipeline every 5 years during the project lifetime.
2. Cost estimate assumes use of diesel only for hydraulic dredge and booster pumps. Increased costs would result if it is projected that General Conformity *de minimus* thresholds would be exceeded with use of diesel fuel and additional diesel emissions control technology or use of electricity is deemed necessary.
3. ATF construction and maintenance dredged material is currently being tested. Some of the material may not meet the USFWS and RWQCB dredged material permit requirements for the HWRP (see Table 2-4). Cost estimate does not account for any offsite disposal of any unsuitable material.
4. Cost estimate does not include construction design, site preparation, permitting documents, relocation, real estate, and other project costs.

2.2.5 Alternative 4: Direct Channel to BMKV Basin

Alternative 4 involves dredging a direct channel across existing outboard marshes from the vicinity of SF-10 to the BMKV site. Under this alternative, dredged material transport vessels would travel from their respective dredging source areas in San Francisco Bay to the BMKV site using the direct channel and transfer dredged materials into a newly constructed basin at the BMKV site for beneficial use at the HWRP. The direct channel would begin near the existing SF-10 in-Bay disposal site because the site is located on the main shipping channel in San Pablo Bay and provides an appropriate depth for access by delivery vessels. Figure 2-7 illustrates the proposed alignment of the direct channel and the location of the proposed BMKV basin site.

Alternative 4 would take an estimated 9 years to complete and would have a maximum basin capacity of approximately 1.6 mcy. Approximately 440,000 cy of additional basin infill and access channel maintenance dredging material would be generated, for a total maximum of approximately 2.1 mcy that could be transferred to the HWRP site for beneficial use. Because the total capacity of the BMKV basin at any one time is expected to be less than 1.7 mcy, the basin is expected to be emptied

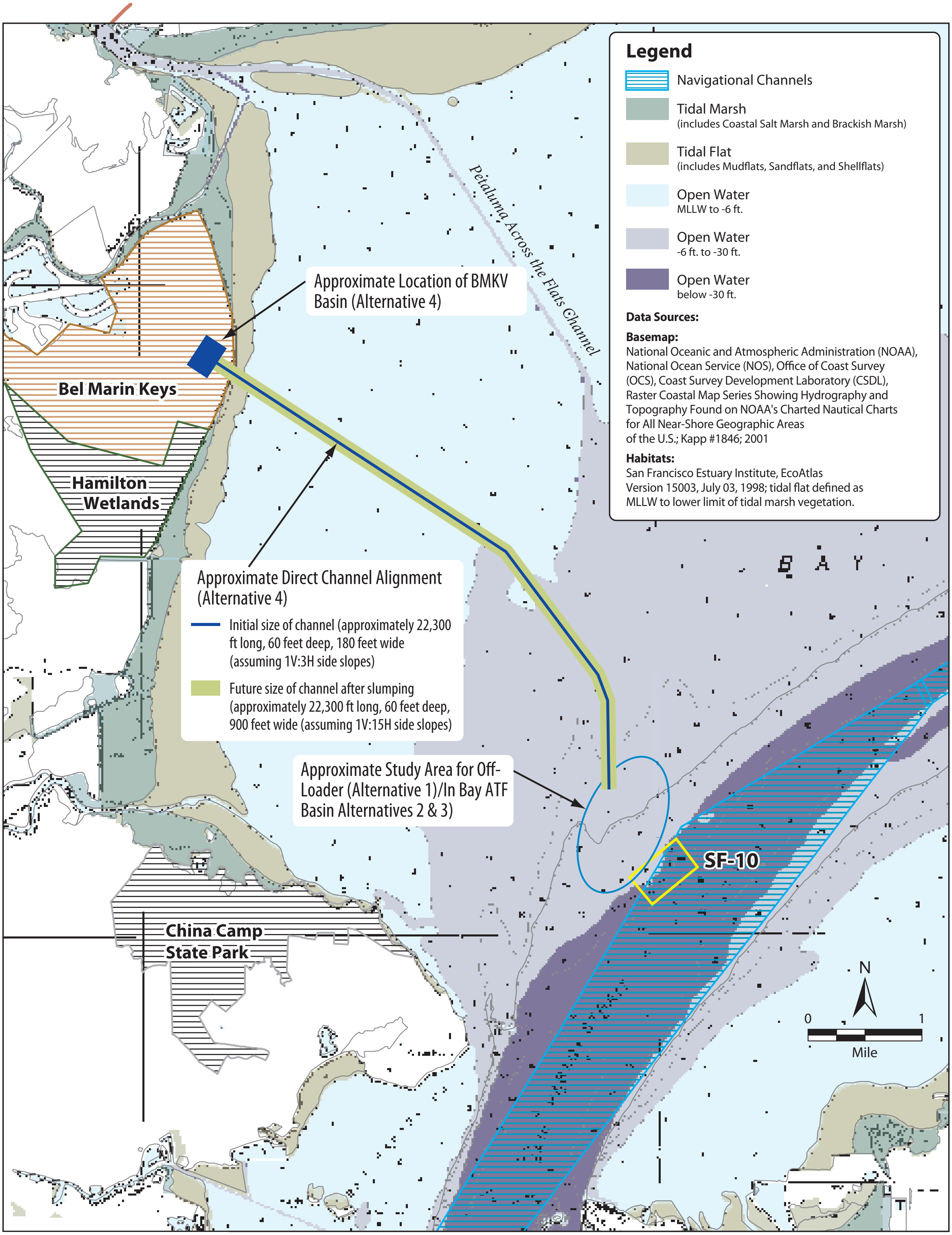

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Figure 2-7
Alignment of Alternative 4: Direct Channel to BMKV Basin

more than once per year; specifically, the USACE is anticipating a 6-month placement window. Considering this basin limit, the maximum operational capacity of this alternative is estimated to be approximately 4.0 mcy; if this alternative were to operate at that maximum capacity, then approximately 3.6 mcy of dredged material would be received and transferred to the HWRP site, with 440,000 cy of the dredged material being sourced from basin infill and direct channel maintenance dredging.

2.2.5.1 Direct Channel

The direct channel would be constructed to be approximately 22,300 feet long by180 feet wide, with assumed 1V:4H side slopes (1 foot vertical to 3 feet horizontal). The direct channel would be excavated to a depth of -17 feet MLLW (including design over-depth dredging) and have an initial total footprint area of 123 ac (119 acres of subtidal/shallow bay and 4 acres of mudflats). Over time, it is expected that the channel's side slopes would slump to 1V:15H, resulting in a total footprint area of 243 ac (233 acres of subtidal/shallow bay and 10 acres of mudflats). The ultimate width of the direct channel is estimated to be approximately 900 feet after channel slumping. Construction of the direct channel would involve dredging approximately 2.0 mcy of material from San Pablo Bay. The direct channel would require annual maintenance dredging of approximately 424,000 cy of material. Similar to Alternatives 2 and 3, material dredged from the direct channel would be used at the HWRP site if it meets the USFWS and RWQCB permitted dredged material quality requirements for HWRP (see Table 2-4).

Alternative 4 would provide for one-way traffic within the direct channel. Total one-way travel distance beyond the proposed ATF basin site would be 6.1 nautical miles; the total round trip transit/placement time would be approximately 2.4 hours. Transport vessels would be limited to large scows with 5,000 cy of capacity, or smaller vessels due to channel depth and vessel draft; the hopper dredges would not be used with this alternative. Additionally, the large scows could only be half-loaded during certain periods of the tidal cycle to a design draft of 12 feet.

The direct channel would experience natural sedimentation, and maintenance dredging would be required to maintain a project depth of -17 feet MLLW. Sediment deposition from the adjacent shallow mudflat area is projected to occur at a rate of 0.35 feet per year and require an estimated annual maintenance dredging of 424,000 cy (see Table 2-3).

2.2.5.2 BMKV Basin

Under Alternative 4, dredged material would be deposited in the excavated BMKV basin. Similar to the proposed ATF basin under Alternatives 2 and 3, the BMKV basin would measure approximately 1,000 feet by 1,500 feet, with a total active footprint of approximately 34 acres. However, the BMKV basin would be excavated to a depth of -27 to -32.5 feet MLLW with 1V:3H side slopes covering an in-active footprint of 10 acres for a total footprint of 44 acres for the basin. In addition to transfer and beneficial use at the HWRP, material excavated from the basin would be used to construct a 13-foot high perimeter levee around the BMKV basin to isolate it from the remainder of the HWRP site This perimeter levee would cover an approximate area of 16 acres, with a total disturbance footprint of 60 acres for both the BMKV basin and levee. The existing outboard levee would be breached to allow tidal access between the BMKV basin and the direct channel, with the perimeter levee surrounding the basin limiting tidal exchange to the basin itself, as described above. Operation constraints related to movement of vessels within the BMKV basin could limit segregation of material. Figures 2-8 and 2-9 illustrate the BMKV basin design schematic and cross-section, respectively.

Total excavation volume of the BMKV basin would be 1.7 mcy. From the total quantity excavated, 525,000 cy would be stockpiled for use as construction material for the BMKV flood control levees and 200,000 cy would be used to construct the temporary BMKV basin perimeter levee. The footprint of the temporary basin levee would be approximately 100 by 7,700 feet (714,705 square feet) and would reach approximately +10.5 MLLW. Given that existing elevations at the site of the BMKV basin are approximately -2.5 MLLW, the levees would be approximately 13 feet above the existing grade.

Two primary vessel types are expected to operate within the BMKV basin facility. These vessels include hydraulic cutterhead pipeline dredges and tug and dump scow combinations. The cutterhead dredge is not a self-powered vessel and would require tug assistance for movement into, out of, and within the basin.

2.2.5.3 Operations and Maintenance

Average annual dredged material delivered to the HWRP site from San Francisco Bay dredging projects is estimated to be 1.6 mcy. When combined with the basin infill (25,000 cy) and the maintenance channel dredged material (416,000 cy), an estimated 2.0 mcy would be dredged from the BMKV basin and transferred to the HWRP site annually.

The maximum annual operational capacity of the basin is estimated to be 4.0 mcy. The maximum amount of dredged material that could be delivered to the BMKV basin from dredging projects annually is estimated to be 3.6 mcy when accounting for the 440,000 cy of basin infill and direct channel dredged material.

Because the total physical capacity of the BMKV basin is less than 1.7 mcy, it is anticipated to be emptied more than once per year. The BMKV basin could operate for receipt of dredged sediment 24 hours per day; however, working hours could potentially be limited due to the proximity of homes in Bel Marin Keys community. For Alternative 4, USACE is anticipating a 6-month placement window; however, annual maintenance dredging of the channel could significantly limit the availability of the BMKV basin during the dredging season.

Alternative 4 assumes the use of either diesel or electric power for the hydraulic cutterhead dredge. The choice of which power source will be used is dependent on cost and which source would ensure that the project emissions are under the conformity levels in any given year. If electrical power is used, then this alternative would likely use similar facilities as currently used by the existing authorized off-loader, with the exception of the power line, which would turn north from the N-1 levee to reach the BMKV basin.

Placement of dredged material into the BMKV basin and transfer of dredged material to the wetlands site could occur simultaneously during the dredging work window. Dredged materials placed in the BMKV basin would be transferred hydraulically across the restoration site using a 20- to 32-inch diesel or electric powered hydraulic cutterhead dredge and delivery pipelines (with no booster pump). For Alternative 4, the onsite basin dredge will be mobilized and de-mobilized each year at the beginning and end of the work window.

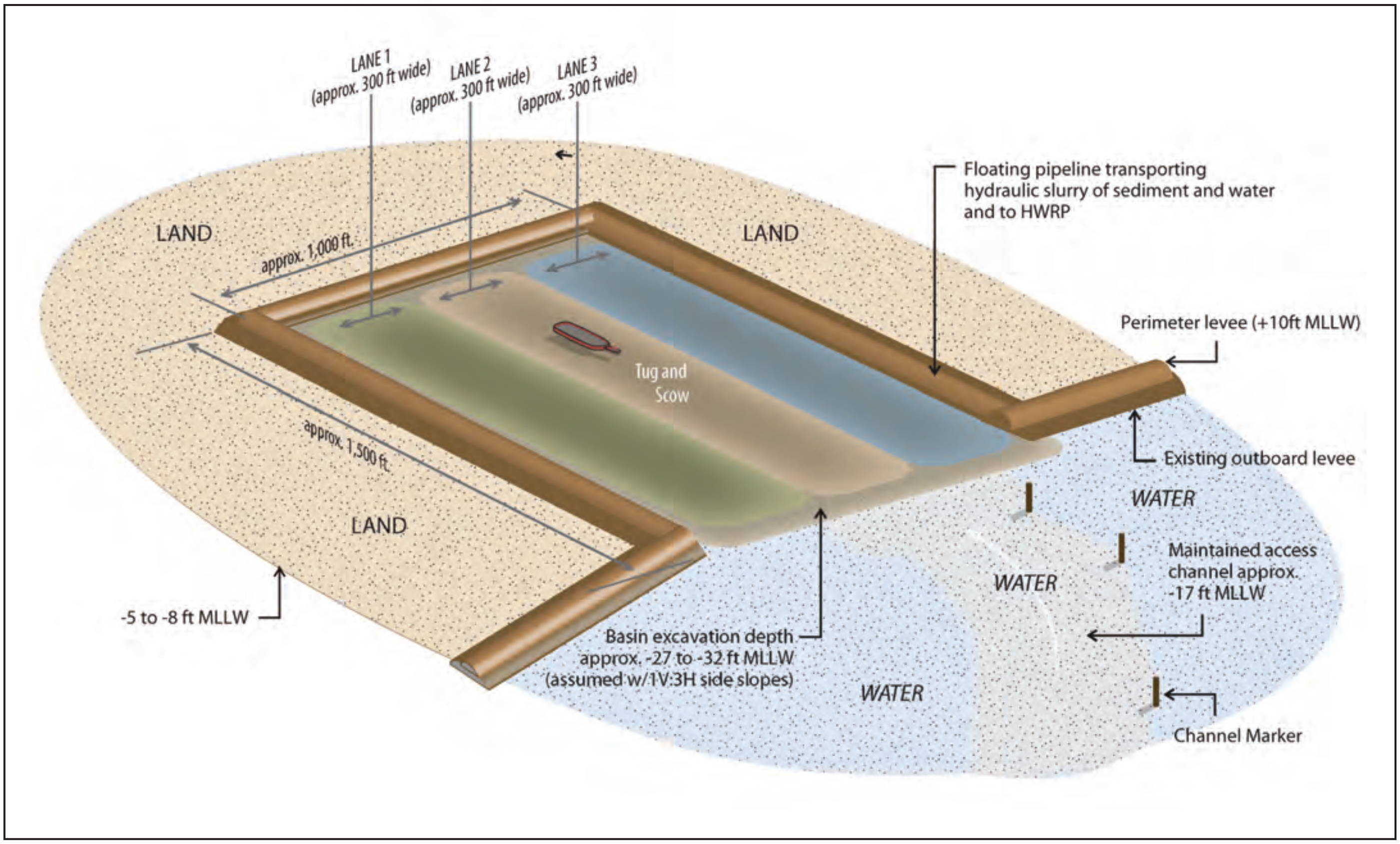

Figure 2-8
Alternative 4: Direct Channel and BMKV Basin

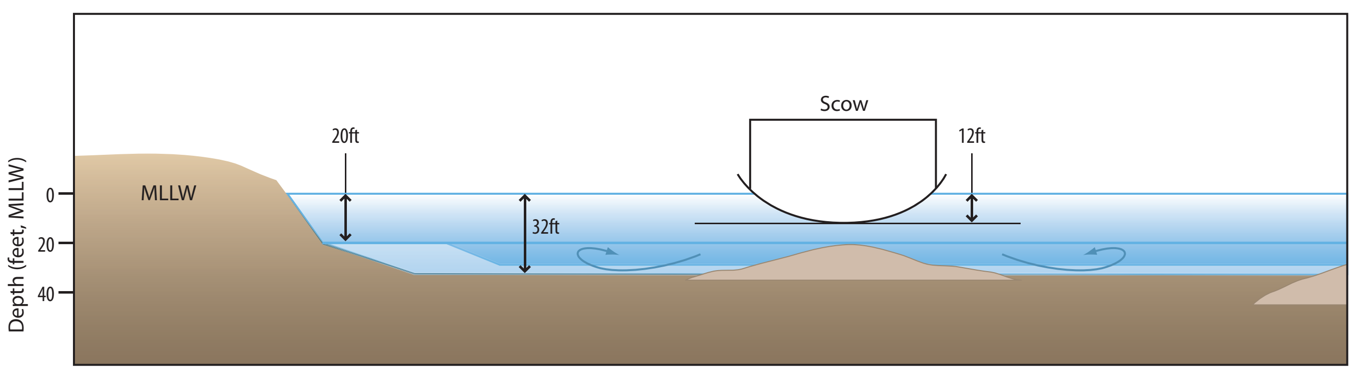

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Figure 2-9
Cross Section of Direct Channel and BMKV Basin

Barge volumes are dependent on tidal stage, vessel traffic, and barge design. Because Alternative 4 could accommodate smaller scow loads (500 to 2,000 cy), similar to Alternatives 2 and 3, the estimated number of scows per day could be slightly higher than for Alternative 1. Additionally, because larger scows (>1,500 cy capacity) could only be half-loaded due to channel constraints, each dredger using Alternative 4 as a placement site would have to make up to twice as many trips to deliver the same amount of material. Barge volumes will be variable, but a significant percentage of barges would need to come partially loaded.

One-way traffic delays are expected within the direct channel alignment when multiple delivery vessels attempt to deliver sediments to the basin. If it is assumed that only one vessel uses the access channel and BMKV basin at a time, the maximum vessels would be 5 (for a 12-hour operation) to 10 (for a 24-hour operation). Presuming that vessel traffic is coordinated such that at times one scow is disposing at the BMKV basin while another is using the one-way channel, the maximum vessels would be 7 to 13 vessels (for a 12 and 24-hour operation, respectively). Additionally, presuming coordination of scow trips such that two scows could travel the channel following each other, dispose in parallel and then exit through the channel, the maximum vessels would be 10 to 20 scows for 12-hour and 24-hour operation, respectively).

2.2.5.4 Facility Construction and Decommissioning

The major steps in construction of Alternative 4 would include the following:

1. Construct perimeter levee surrounding BMKV basin and upgrade the BMKV flood control levee.
2. Mobilize bulldozers, excavators, scrapers, and other land-based equipment to excavate BMKV basin.
3. Breach the existing outboard levee connecting the basin site to San Pablo Bay.
4. Mobilize hydraulic cutterhead dredge, pipeline, and support plant as necessary to be located in BMKV basin.
5. Excavate Direct Channel to required dimensions.

Excavation of the BMKV basin would occur simultaneously with excavation of the access channels. Dredged materials that meet RWQCB and USFWS permitted requirements for the HWRP would be pumped directly onto the restoration site. Because a portion the basin would be excavated prior to breaching the perimeter levee, construction would occur partially in the dry condition and would not need to be restricted to the dredging work window. The remaining basin excavation would occur once the hydraulic cutterhead dredge is in place. It would take approximately 6 months to construct the temporary basin perimeter levees, excavate the direct channel and BMKV basin, and breach the outboard levees.

Decommissioning the BMKV basin would be accomplished through natural shoaling and/or placement of clean dredged material in the BMKV basin until restoration to final wetland restoration elevations. The first 722,000 cy could be delivered by scow, after which the remainder (960,000 cy) would need to come from upland sources or an off-loader facility. Some of the fill material could include the perimeter levee surrounding the basin. Decommissioning the BMKV basin would also include temporary reconstruction of the outboard levee connecting the basin to San Pablo Bay until the HWRP was complete and ready for tidal exchange. The direct channel in Alternative 4 would be left to fill over time through natural sedimentation and shoaling processes.

2.2.5.5 Cost Estimate

The cost estimate for construction and operation of Alternative 4 is approximately $232 million. This cost estimate is approximately $70 to $215 million less than the authorized off-loader facility in Alternative 1, but $113 million greater than the proposed ATF in Alternative 2. Detailed breakdown of the cost estimate developed by USACE is shown in Table 2-5. Cost assumptions (including escalation) are further detailed in the Moffat & Nichol report, included in Appendix B of this SEIS/EIR. The cost estimates provided in this SEIS/EIR are not final, and are subject to revision during the project development process.

The following are outstanding cost estimate issues:

1. The existing submerged aviation fuel pipeline crosses the alignment of the direct channel. Removal of this pipeline has not been included in cost estimates.
2. The cost estimate assumes use of diesel for hydraulic dredge and booster pumps. Increased costs would result if the General Conformity *de minimus* thresholds would be exceeded in any given year with use of diesel fuel and additional diesel emissions control technology or if use of electricity is deemed necessary.
3. Alternative 4 could result in increased operational costs to dredging projects due to limited availability of dump scows (caused by a shift in disposal requirements for certain dredging projects) and half-loading requirements based on channel constraints (may result in twice as many delivery trips). These costs have not been quantified.
4. Channel construction and maintenance material is currently untested, and may not be suitable for use on the HWRP site (see Table 2-4).
5. Cost estimate does not account for offsite disposal of unsuitable material from the direct channel, BMKV basin, or annual maintenance dredging in the event unsuitable material is encountered.
6. Cost estimate does not include construction design, site preparation, permitting documents, relocation, real estate, and other project costs.

2.3 Tier 2—Alternative Considered but Screened Out From Further Consideration

Alternative 5 was screened out based on application of the screening criteria described in Section 2.1 above, and in Table 2-1 at the end of this chapter. Alternative 5 is similar to Alternative 4, except with potential to result in greater impacts to fish and wildlife species habitat, recreational boater traffic, and water and air quality impacts due to dredging of an expanded navigation channel along the Petaluma River across the flats channel and Novato Creek. Based on the alternative screening process conducted for the proposed project, USACE and Conservancy believed that Alternative 5 had an unacceptable level of impacts related to Novato Creek to be consistent with the overall objectives of the HWRP. As such, Alternative 5 was dismissed from further analysis in this SEIS/EIR. A description of Alternative 5 follows.

2.3.1 Alternative 5: Novato Creek Channel to BMKV Basin

Alternative 5 involves expanding the existing Petaluma River and Novato Creek channels to allow for transport of dredged materials by barge directly to the BMKV site. Figure 2-10 illustrates the proposed alignment of the expansion of the Novato Creek Channel to shore. Under this alternative, dredged material transport vessels would travel from their source areas to the BMKV site using the Novato Creek Channel. Similar to Alternative 4, dredged material would be placed in a landward basin constructed at the BMKV site.

Under Alternative 5, the navigation channel is divided into three distinct sections: 1) the existing Petaluma River across the Flats channel, 2) the connection to Novato Creek, and 3) the Novato Creek channel. The depths and widths of all three sections would be substantially expanded to accommodate delivery vessels. The existing Petaluma River channel existing at a depth of -11.5 foot MLLW, the connection to Novato Creek at an existing depth ranging between -3 and -11.5 feet MLLW, and the Novato Creek channel at an existing depth of -4 foot MLLW would all be deepened to an overall depth of -17 foot MLLW depth (including design over-depth) with assumed 1V:3H side slopes. These channels would also be broadened from their existing widths to approximately 200 feet, not including passing lanes and expected sloughing of the channel’s side slopes.

Initial excavation of the three channel segments and passing lanes (including over-depth) would result in 3.6 mcy of sediment. Annual maintenance dredging for Alternative 5 would total over 500,000 cy. In sum, the maximum volume of dredged material created from the three channel segments and passing lanes would be over 8 mcy of material. All dredged material to be beneficially used at the HWRP site – including channel and BMKV basin excavation and maintenance volumes – would be required to meet dredged material permit requirements outlined by the RWQCB and USFWS BO standards for the HWRP (see Table 2-4). Placement at the HWRP site would reduce the overall timeline established for the wetlands restoration projects, but limit the amount of dredged material that could be beneficially used from other in-Bay dredging projects.

Excavation of the connecting channel to Novato Creek and the Novato Creek channel itself would result in the removal of existing substrate in San Pablo Bay. Initially, the excavated slopes of the three channels would be 1V:3H, resulting in a total of approximately 100 acres of substrate disturbance during excavation of the full channel length and passing lanes: 71 acres of subtidal/shallow bay, 19 acres of mudflats, and 12 acres of tidal salt marsh. Over time, it is expected that the channel’s side slopes would slough to 1V:15H, resulting in a total of approximately 326 acres of habitat disturbance: 220 acres of subtidal/shallow bay, 66 acres of mudflats, and 41 acres of tidal salt marsh.

Alternative 5 would take approximately 9 years (2009–2018) to complete transfer of dredged material to the HWRP site, if receiving federal and medium-size dredging project material.

2.3.1.1 Novato Creek Channel

In Alternative 5, the navigation channel is divided into three distinct sections: 1) the existing 30,000-foot long Petaluma River across the Flats channel, 2) the 3,000-foot-long connection to Novato Creek, and 3) the 7,400-foot long Novato Creek channel. These channels would also be broadened from their existing widths to approximately 200 feet, not including passing lanes and expected sloughing of the channel's side slopes.

Alternative 5 would include one-way traffic with periodic turnouts and passing lanes. Transport vessels would be limited to large scows (5,000 cy) or smaller vessels due to channel depth and vessel draft; larger vessels could only be half-loaded to a design draft of 12 feet. Total additional one-way travel distance beyond the in-Bay ATF basin site is 10.2 nautical miles under this alternative. Total additional miles traveled for delivery of the same amount of dredged material would be 40.8 miles (two trips out and back) compared to Alternatives 2 and 3. This does not include the distance traveled from the dredged material source site. The total round trip transit/placement time would be approximately 3.7 hours. In comparison to Alternatives 1, 2, and 3, the rate of material placement would be reduced due to increased transit time and vessel size limitations.

2.3.1.2 BMKV Basin

The Novato Creek Channel alternative would also employ an excavated BMKV basin similar to that described above under Alternative 4. Total excavation volume and stockpiling would be comparable to Alternative 4. However, due to slight differences in basin siting, the footprint of the temporary perimeter basin levee would be approximately 90 by 7,900 feet (737,025 square feet).

2.3.1.3 Operations and Maintenance

Alternative 5 would encounter natural sedimentation within the access channel, and maintenance dredging would be required to maintain a project depth of -17 feet MLLW. In addition, the increased water depth from the expanded channel may slow down the current velocity in the channel, resulting in greater likelihood of sediment deposition, which is projected to occur at a rate of 0.35 feet per year. As a result, the three channel segments and passing lanes would require an estimated annual maintenance dredging of over 500,000 cy.

Under Alternative 5, equipment will be diesel or electric powered and a short transfer pipeline will be installed to slurry the dredged materials across the wetlands restoration sites. If electrical power were used instead, then this alternative would likely use similar facilities as currently used by the existing authorized off-loader, with the exception of the power line, which would turn north from the N-1 levee to reach the BMKV basin.

Assuming no timing constraints and no limitation on two-way traffic (due to presence of passing lanes, etc.), it is estimated that there could be 0 to 40 vessels per day with a daily average of 8 to 12 scows when dredged material source projects are actively dredging; days with more than 20 vessels are expected to be very rare.

2.3.1.4 Facility Construction and Decommissioning

The major steps in construction for Alternative 5 would include the following:

1. Construct perimeter levee surrounding BMKV basin and upgrade the BMKV flood control levee.
2. Mobilize bulldozers, excavators, scrapers, and other land-based equipment to excavate BMKV basin.

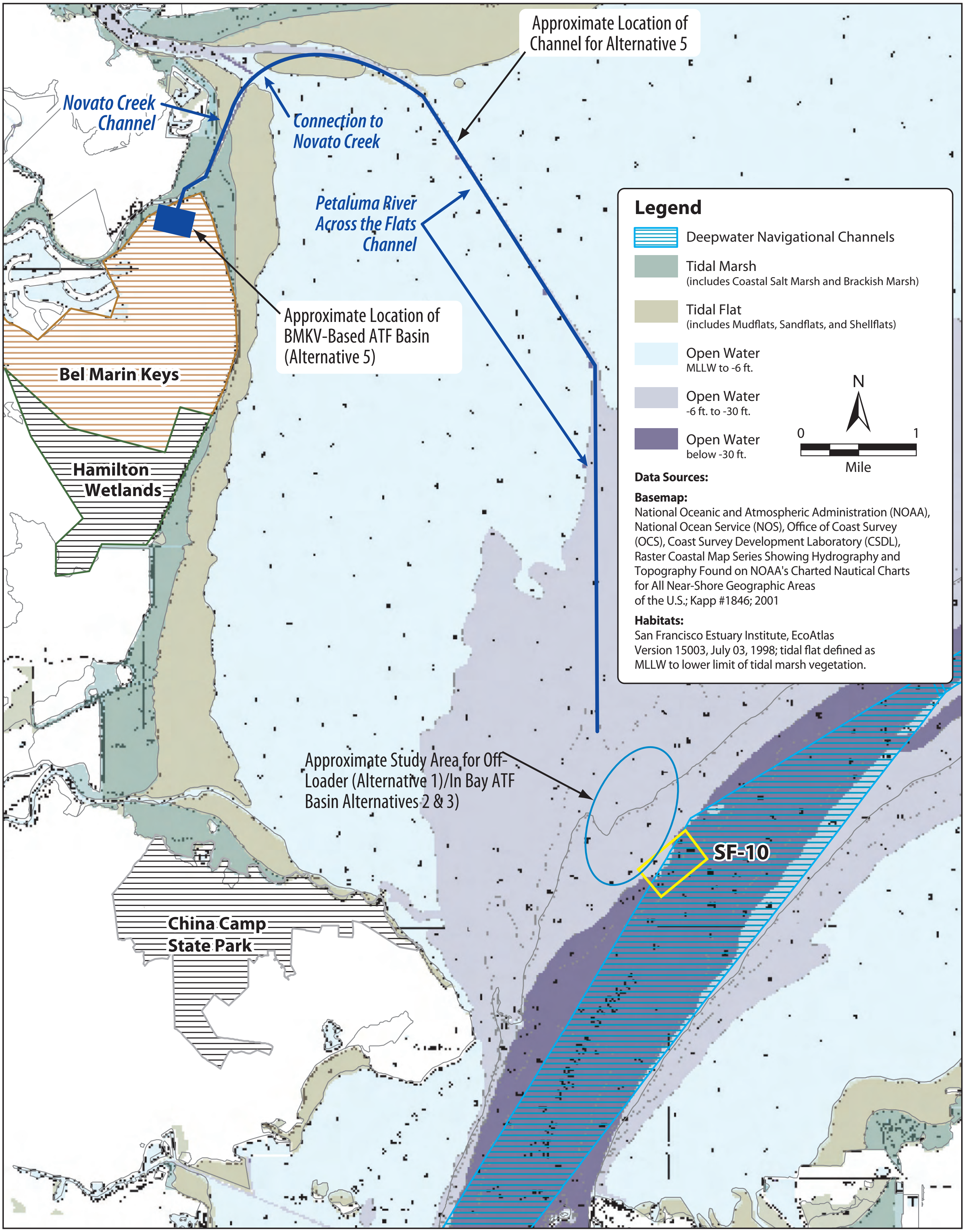

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Figure 2-10
Alignment of Alternative 5: Novato Creek Channel to BMKV Basin

3. Breach the existing outboard levee connecting the basin site to San Pablo Bay (via Novato Creek).
4. Mobilize and install short length of pipeline and booster pumps to be located at the BMKV basin.
5. Excavate the Novato Creek Channel to required dimensions (including Petaluma River across the Flats portion and passing lanes).

Excavation of the BMKV basin would occur simultaneously with excavation of the access channels. Dredged materials that meet RWQCB and USFWS permitted requirements for the HWRP would be pumped directly to the HWRP site. Because a portion of the basin would be excavated prior to breaching the perimeter levee, construction would occur partially in the dry condition and would not need to be restricted to the dredging work window. However, the remaining basin excavation may occur once the hydraulic cutterhead dredge is in place. It would take approximately 6 months to excavate the BMKV basin and construct the temporary basin perimeter levees.

Decommissioning the BMKV basin would be similar to Alternative 4, as described above. The excavated channels would be left to fill in through natural sedimentation and shoaling processes over time.

2.3.1.5 Cost Estimate

The cost estimate for construction and operation of the Novato Creek Channel ATF is $215.2 million. This cost estimate is approximately $87 to $232 million less than the authorized off-loader facility in Alternative 1, but $96 million greater than the proposed ATF in Alternative 2. Detailed breakdown of the cost estimate developed by USACE is shown in Table 2-5. Cost assumptions (including escalation) are further detailed in the Moffat & Nichol report, included in Appendix B of this SEIS/EIR.

2.3.1.6 Outstanding Issues

1. Isolation of the BMKV-based basin from San Pablo Bay may be desirable to reduce sediment loss and reduce water quality impacts. However, use of silt curtains is not feasible due to tidal currents.
2. Cost estimate assumes use of diesel for hydraulic dredge and booster pumps. Increased costs would result if the General Conformity Analysis *de minimus* thresholds would be exceeded in any given year with use of diesel fuel and if additional diesel emissions control technology or use of electricity is deemed necessary.
3. Alternative 5 could result in increased operational costs to dredging projects due to limited availability of dump scows (due to shift in disposal requirements for certain dredging projects) and half-loading requirements based on channel constraints (may result in twice as many delivery trips). These costs have not been quantified.
4. Operational constraints regarding the movement of vessels within the BMKV basin could limit the segregation of material.
5. Channel construction and maintenance material is currently untested yet, and may not be suitable for unconfined aquatic disposal (see Table 2-4).

6. Cost estimate does not account for offsite disposal of unsuitable material from the Novato Creek channel, BMKV basin, or annual maintenance dredging should unsuitable material be encountered.
7. There is the potential for limited working hours due to proximity of residential structures in the Bel Marin Keys community.
8. Cost estimate does not include construction design, site preparation, plant propagation, permitting documents, relocation, real estate, and other project costs.

2.4 Tier 3—Alternatives Dismissed from Further Consideration

The following alternatives were dismissed from further consideration during preliminary screening due to feasibility issues.

2.4.1 Alternative 6: Partially Confined Aquatic Transfer Facility

Under a Partially Confined ATF alternative, sheet piles would only be constructed to surround a portion of the ATF basin. A permutation of this concept, in which sheet piles were placed at the upstream (northeast) end of the ATF, was subjected to hydrodynamic modeling (see Appendix A). This modeling revealed that bottom shear stress values at the base of the confining wall, particularly where currents were diverted around the partial walls, would likely result in significant scour and resulting instability of the sheet piles. A significant wake zone formed to the northeast of the ATF basin due to the diversion. For this reason, such an alternative was not considered technically feasible. Additionally, the partially confined aquatic transfer facility might be a hazard or obstruction to ship and boat traffic in the Bay.

In addition, the Partially Confined ATF was generally considered to be an intermediate case that would have impacts that fall between those of the unconfined and fully confined ATF configurations. Should this alternative be determined to be technically feasible in the future, its impacts would be captured by the impact analysis conducted for Alternatives 2 and 3.

2.4.2 Alternative 7: Truck or Rail Transport

The dredged material that would be accommodated by the proposed action originates and is currently disposed of in aquatic environments. The additional cost of transferring this material to truck or rail would substantially exceed the cost of disposal at existing aquatic disposal sites, and would therefore be unlikely to be used as an option by dredgers. In addition, such an alternative would have substantial impacts over a wide geographic extent, such as congestion of land-based transportation systems, air emissions, noise, disturbance to local residents, etc. Impacts would be anticipated both at the sites of transfer to/from truck and/or rail, and along the truck/rail transportation route. As such, this alternative was not considered feasible and is not considered further.

To implement this alternative, source dredging would need to transfer dredged material to shore and into trucks or train transport; the trucks or trains would have to be routed from the onshore location to the HWRP site. Train transport would require transfer to trucks at the train line west of the project site for truck transfer onto the HWRP site. To give an idea of the magnitude of trucking necessary, a large dredge scow holds up to 5,000 cy of dredged material. Assuming use of trucks with capacity of approximately 20 cy, an estimated 250 trucks would be necessary to transport one large scow equivalent. The amount of scow trips for Alternative 2 would be 8-12 per day on average, which would correspond to up to 3,000 truck round trips/day.

If trucking were done on a 24-hour basis, this would correspond to nearly 125 trucks per hour entering the site (or 2 trucks per minute). Trucking would more likely only be done during daylight. If trucking were done on a 12-hour basis, this would correspond to nearly 250 trucks per hour entering the site (or over 4 trucks per minute). The estimated level of truck trips would have substantial air quality, traffic, and noise impacts that would likely be unacceptable to local residents.

Table 2-1. Ranking Results for the Alternatives Screening Process

Screening Criteria	Ranking Considerations *Degree to which alternative attains the criteria dictates ranking 5 through 1.*	Alternative 1: Dredged Material Off-Loader Facility	Alternative 2: Unconfined In-Bay ATF	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin	Alternative 5: Novato Creek Channel to BMKV Basin
Project Purpose/ Objectives						
Offer operational flexibility for the type of dredged material transport vessels that could deliver material for beneficial use at the HWRP site.	Alternative attains this project objective. Offer operational flexibility for the type of dredged material transport vessels able to deliver material.	1 No use of hopper dredges and smaller scows, which could result in scheduling conflicts and delays.	5 Allows efficient use of both scows and hopper dredges.	5 Allows efficient use of both scows and hopper dredges.	3 Limitations of delivery vessel draft (half-loading), which could result in scheduling conflicts and delays.	3 Limitations of delivery vessel draft (half-loading) which could result in scheduling conflicts and delays.
Maximize potential sources of dredged material and the capability to stockpile dredged material for future beneficial use at HWRP when the site is not actively accepting material (rather disposing of dredged material at in-Bay and ocean sites).	Alternative attains this project objective. Maximizes receipt of dredged material from both federal and other permitted projects. Maximizes flexibility to stockpile material for use at the expansion sites.	1 No use of hopper dredges may restrict delivery by some dredgers. Off-loader facility may limit sorting of material.	5 Could accommodate all types of delivery vessels. Allows sort of material by grain size.	5 Could accommodate all types of delivery vessels. Allows sort of material by grain size.	3 Limitations of delivery vessel draft (half-loading) may dissuade use by some dredgers. Allows sort of material by grain size.	3 Limitations of delivery vessel draft (half-loading) may dissuade use by some dredgers. Allows sort of material by grain size.
Provide a reliable, cost effective means of transporting dredged material to the HWRP site.	Alternative attains this project objective. Provides for reliable transfer of dredged material at lowest cost.	1 Highest cost (up to $447 million). Potential for gaps in receipt of dredged material if off-loader facility is offline for maintenance.	5 Lowest cost ($119 million). Maintenance (dredging of basin) could occur simultaneously with material placement.	4 Low cost ($133 million). Maintenance (dredging of basin) could occur simultaneously with material placement.	2 Moderate cost ($232 million). Potential scheduling conflicts and queuing at direct channel entrance.	3 Moderate cost ($215 million). Potential queuing of delivery vessels in passing lanes of channel.
Facilitate implementation of the Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region (San Francisco Bay LTMS) through beneficial use of dredged material.	Alternative attains this project objective. Reduces in-Bay disposal volumes by providing beneficial use of dredged material to the HWRP site. Considers the reduction in use volumes due to utilization of construction and maintenance dredged material for the alternative itself.	3 Captures 1.2 mcy of dredge project material annually. Would not capture the small permitted dredging projects.	5 Captures 1.6 mcy of dredge project material annually. Beneficially uses 74% off-site and 26% project-related material.	5 Captures 1.6 mcy of dredge project material annually. Beneficially uses 74% off-site and 26% project-related material.	2 Captures 1.6 mcy of dredge project material annually. Beneficially uses 65% off-site and 35% project-related material.	1 Captures 1.3 mcy of dredge project material annually. Beneficially uses 55% off-site and 45% project-related material.

Screening Criteria	**Ranking Considerations** ***Degree to which alternative attains the criteria dictates ranking 5 through 1.***	Alternative 1: Dredged Material Off-Loader Facility	Alternative 2: Unconfined In-Bay ATF	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin	Alternative 5: Novato Creek Channel to BMKV Basin
Implementation Feasibility						
Minimizes capital and O&M costs	Total alternative cost does not exceed Congressional approval in WRDA. Includes project bond costs for facility removal and payouts to re-routed dredge vessels.	1 $279,937,000–447,295,000	5 $118,663,000	4 $133,258,000	2 $232,364,000	3 $215,198,000
Risk analysis for costs	Total alternative cost has low risk of exacerbation over project lifetime.	1 High risk of cost exacerbation due to operational inflexibility.	5 Low risk of cost escalation.	4 Moderate risk of cost escalation due to rising steel costs.	3 Moderate risk of cost escalation due to maintenance dredging (423,500 cy).	2 Moderate risk of cost escalation due to maintenance dredging (502,700 cy).
Meets overall project timeline	Alternative can be operational within 2 years of construction initiation. Alternative allows completion of HWRP project within 12 to 20 years.	1 Can be operational within 2 years and allows completion within 18 years.	3 Can be operational within 2 years and allows completion within 10 years due to operational flexibility.	3 Can be operational within 2 years and allows completion within 10 years due to operational flexibility.	5 Can be operational within 2 years and allows completion within 9 years due to project-related material disposal.	5 Can be operational within 2 years and allows completion within 9 years due to project-related material disposal.
Technical feasibility	Technology employed to construct, operate, or maintain an alternative is adequate to ensure that the basic project purposes can be reasonably met. No unreasonable geotechnical or engineering problems.	4 No potential to use hopper dredges or small scows.	5 Alternative is technically feasible. Allows efficient use of both scows and hopper dredges. Allows sort of material by grain size.	3 Stabilizing confinement walls may create technical challenges. Allows efficient use of both scows and hopper dredges. Allows sort of material by grain size.	1 Ongoing shoaling may create slope stability challenges. Limitations of draft of delivery vessels (half-loading).	3 Ongoing shoaling may create slope stability challenges. Limitations of draft of delivery vessels (half-loading).
Operational flexibility	Accommodates flexible scheduling for receipt of dredged material deliveries. Minimal standby time. Provides ability to segregate material as needed.	3 Able to process dredged material deliveries 12.8 hrs/day. Low operational reliability and flexibility. Time-consuming operations and ability to off-load only one vessel at a time may cause scheduling conflicts. Restricted ability to sort material by grain size.	5 Able to receive dredged material deliveries 24 hrs during work window.	4 Able to receive dredged material deliveries 24 hrs; but navigation within confinement may cause delays.	2 Additional 2.4 hrs travel time for two delivery trips (due to half-loaded scows) will restrict operations and increase costs to dredgers. Potential limited working hours due to proximity of homes in Bel Marin Keys.	1 Additional 3.7 hrs travel time for two delivery trips (due to half-loaded scows) will restrict operations and increase costs to dredgers. Potential limited working hours due to proximity of homes in Bel Marin Keys.

Screening Criteria	**Ranking Considerations** *Degree to which alternative attains the criteria dictates ranking 5 through 1.*	Alternative 1: Dredged Material Off-Loader Facility	Alternative 2: Unconfined In-Bay ATF	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin	Alternative 5: Novato Creek Channel to BMKV Basin
Navigational safety	Avoids or minimizes duration and intensity of navigational safety hazards for commercial or recreational craft during facility operation. Considers geographic footprint of navigational area affected.	4 Off-loader facility would create a large immobile object within a close proximity to major shipping channels; however, it is a visible activity used by multiple contractors.	5 Few navigational safety hazards associated with basin.	3 Navigational safety hazards associated with protruding piers and basin confinement.	3 Width of channel would accommodate project-related vessel traffic. However, recreational boaters who may use channel for fishing could present safety hazards.	1 Width of channel and passing lanes would accommodate recreational and project-related vessel traffic. Recreational boaters could present safety hazards.
Impacts to dredge disposal projects	Accommodates deliveries from typical dredge barges/hoppers without conflict. Allows scheduled deliveries within fish window requirements. Does not have specialized equipment requirements. Would not significantly delay or impair ability of dredge projects to be completed.	1 Potential significant delays for disposal vessels waiting to moor to off-loader facility.	5 Negligible impacts to dredge disposal projects.	4 Negligible impacts to dredge disposal projects.	3 Potential increased costs to dredge disposal projects from longer travel distances and vessel loading limitations.	2 Potential increased costs to dredge disposal projects from longer travel distances and vessel loading limitations.
Public concerns	Minimizes potential for public concerns about environmental impacts or maritime safety hazards resulting from operation of the proposed alternative.	5 Public concern over visual impact of off-loader facility.	4 Public concern over turbidity impacts on fisheries and marine mammals.	3 Public concern over turbidity impacts and confinement barrier on fisheries and marine mammals.	2 Public concern over dredging new channel through tidal habitats and proximity of basin to Bel Marin Keys community.	1 Public concern over dredging new channel through tidal habitats, proximity of basin to Bel Marin Keys community, and recreational boater navigation in Novato Creek channel.
<u>Environmental Impacts</u>						
Physical substrate (aquatic)	Avoids major alteration of substrate elevation or contours (does not apply to HWRP site). Does not adversely affect bottom-dwelling organisms at the site by smothering immobile forms or forcing mobile forms to migrate. Avoids erosion, slumping, or lateral displacement of surrounding bottom deposits. Considers geographic footprint of substrate area affected.	3 Negligible changes in physical substrate at the off-loader facility site; minor changes along pipeline length. Continued disposal of .4 mcy at in-Bay and ocean disposal sites annually.	5 Changes in water circulation and sediment transport at ATF basin site.	5 Changes in water circulation, sediment transport, and erosion at base of confinement.	1 Changes in physical substrate and substantial shoaling along the 22,300-ft channel alignment. Potential long-term effects on geomorphology of mudflats due to new channel.	2 Changes in physical substrate and substantial shoaling along the 40,400-ft channel alignment.

Screening Criteria	**Ranking Considerations** *Degree to which alternative attains the criteria dictates ranking 5 through 1.*	Alternative 1: Dredged Material Off-Loader Facility	Alternative 2: Unconfined In-Bay ATF	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin	Alternative 5: Novato Creek Channel to BMKV Basin
Suspended particulates/turbidity	Avoids elevated levels of suspended particulates in the water column due to vessel discharge and/or scour. Does not reduce light penetration or cause lowered rates of photosynthesis. Does not encourage oxygen depletion. No toxic metals and organics, pathogens, and viruses absorbed or adsorbed to fine-grained particulates in the water column or on the substrate. Minimizes turbid plumes outside of the mixing zone.	3 Minor suspended sediment spilled into water from the off-loader facility. Minor erosion likely at base of piling structure. Continued disposal of .4 mcy at in-Bay and ocean disposal sites annually.	4 Turbidity generated by dredged material placement and removal at ATF basin. Turbid process water discharged from transfer pipeline.	5 Turbidity generated by dredged material placement and removal at ATF basin; however, confinement limits turbidity plume. Erosion likely at base of confinement. Turbid process water discharged from transfer pipeline.	2 Turbidity generated by vessel traffic and annual maintenance dredging along the 22,300-ft channel alignment.	1 Turbidity generated by vessel traffic and annual maintenance dredging along the 40,400-ft channel alignment.
Water contaminants (sediment disposal)	Avoids introduction of chemical constituents in suspended or dissolved form and/or changes in the clarity, color, odor, or temperature of receiving water due to contaminants within disposal materials. Minimizes introduction of nutrients or organic material. Avoids loading to receiving waters.	3 Water quality concerns with discharge/flush water after each delivery. Continued disposal of .4 mcy at in-Bay and ocean disposal sites annually.	4 Flushing of transfer pipeline only after dredging of stored material. Potential for disturbance of sediment-bound toxics (such as mercury) at basin site.	5 Potential idling by scows waiting to enter confinement. Flushing of transfer pipeline only after dredging of stored material. Potential for disturbance of sediment-bound toxics (such as mercury) at basin site.	2 Potential for disturbance of sediment-bound toxics (such as mercury) along channel alignment.	1 Potential for disturbance of sediment-bound toxics (such as mercury) along channel alignment.
Water contaminants (vessel emissions)	Avoids introduction of chemical constituents in suspended or dissolved form and/or changes in the clarity, color, odor, or temperature of receiving water due to increased vessel traffic emissions. Minimizes introduction of nutrients or organic material. Considers petroleum and hazardous materials releases from both delivery vessels and the alternative facility.	3 Discharge of contaminants from delivery vessels, engines associated with the off-loader facility, and in-line booster pumps. Continued disposal of .4 mcy at in-Bay and ocean disposal sites annually.	5 Discharge of contaminants from delivery vessels, cutterhead dredge within basin, and in-line booster pumps.	5 Discharge of contaminants from delivery vessels, cutterhead dredge within basin, and in-line booster pumps.	2 Discharge of contaminants by vessel traffic along the 22,300-ft channel alignment, as well as BMKV-based dredge and pump stations.	1 Discharge of contaminants by vessel traffic along the 40,400-ft channel alignment, as well as BMKV-based dredge and pump stations.
Water circulation, fluctuation, and salinity	Does not adversely modify current patterns and water circulation by obstructing flow, changing the direction or velocity of water flow and circulation, or otherwise changing the dimensions of a water body. Does not alter normal water-level fluctuation patterns, result in prolonged periods of inundation, exaggerate extremes of high and low water, or result in a static water level. No negative changes to existing salinity gradients. Considers the geographic footprint of water column affected.	5 No changes in water circulation at the off-loader facility site; minor changes along pipeline length.	4 Changes in water circulation and current pattern at ATF basin site.	3 Changes in water circulation and current pattern at ATF basin site and confinement.	2 Changes in water circulation and velocity along the 22,300-ft channel alignment. Potential long-term effects on tidal mudflats due to new channel.	1 Changes in water circulation and velocity along the 40,400-ft channel alignment. Potential long-term effects on creek flows in Novato Creek channel.

Screening Criteria	**Ranking Considerations** *Degree to which alternative attains the criteria dictates ranking 5 through 1.*	Alternative 1: Dredged Material Off-Loader Facility	Alternative 2: Unconfined In-Bay ATF	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin	Alternative 5: Novato Creek Channel to BMKV Basin
Special status species	Does not adversely affect the following populations of special status species due to habitat modification: Salmonids (Steelhead, Chinook salmon)	3 Minor shading impacts to salmonids. Potential for fish entrainment for process water but intake will be screened. Continued disposal of .4 mcy at in-Bay and ocean disposal sites annually.	5 Minor turbidity impacts to salmonids. Potential for fish entrainment for process water.	4 Minor turbidity impacts to salmonids. Confinement may confuse fish movement. Potential for fish entrainment for process water.	2 Minor turbidity impacts to salmonids. Potential for fish entrainment for process water. Potential direct mortality along access channel or in basin due to impinged escape routes.	1 Minor turbidity impacts to salmonids. Potential for fish entrainment for process water. Potential direct mortality along access channel or in basin due to impinged escape routes.
	Fish (Tidewater goby, Delta smelt, Longfin smelt, Pacific lamprey, River lamprey)	5 Minor increase in fish species due to detritus from fouling organisms on the off-loaders surfaces. Shading may attract some fish and deter others. Potential for fish entrainment for process water but intake will be screened.	3 Some fish species (perches, striped bass, sturgeon, white croaker) may orient to basin slopes or turbidity. Potential for fish entrainment for process water.	4 Some fish (perches, striped bass, herring) may orient to confinement pilings. Potential for fish entrainment for process water.	2 Loss of juvenile fish habitat in shallow bay. Redirects water circulation and fish movements along the 22,300-ft channel alignment. Turbidity from vessel traffic and shoaling may degrade fish habitat. Potential for fish entrainment for process water. Potential direct mortality along access channel or in basin due to impinged escape routes.	1 Loss of juvenile fish habitat in shallow bay. Redirects water circulation and fish movements along the 40,400-ft channel alignment. Turbidity from vessel traffic and shoaling may degrade fish habitat. Potential for fish entrainment for process water. Potential direct mortality along access channel or in basin due to impinged escape routes.
	Green sturgeon	5 Minor impacts.	4 Green sturgeon may orient to basin slopes or turbidity. Potential direct mortality during dredged material placement in ATF.	3 Green sturgeon may orient to basin slopes or turbidity. Confinement may confuse fish movement. Potential direct mortality during dredged material placement in ATF.	2 Disruption of green sturgeon during construction and maintenance of 22,300-ft channel alignment. Potential direct mortality along access channel or in basin due to impinged escape routes.	1 Disruption of green sturgeon during construction and maintenance of 40,400-ft channel alignment. Potential direct mortality along access channel or in basin due to impinged escape routes.
	Marine mammals (Steller sea lion, Harbor seal)	5 Minor shading impacts to marine mammals.	4 Minor turbidity impacts to marine mammals.	3 Minor turbidity impacts to marine mammals. Confinement may confuse mammal movement.	2 Disruption of marine mammals during construction and maintenance of 22,300 ft channel alignment.	1 Disruption of marine mammals during construction and maintenance of 40,400 ft channel alignment.

Screening Criteria	**Ranking Considerations** ***Degree to which alternative attains the criteria dictates ranking 5 through 1.***	**Alternative 1: Dredged Material Off-Loader Facility**	**Alternative 2: Unconfined In-Bay ATF**	**Alternative 3: Confined In-Bay ATF**	**Alternative 4: Direct Channel to BMKV Basin**	**Alternative 5: Novato Creek Channel to BMKV Basin**
Aquatic ecosystem and organisms	Does not affect populations of non-listed fish, benthos (amphipod, clams), crustaceans, mollusks, and other food web organisms. Avoids debilitation or death of sedentary organisms by smothering, reduction in food supply, or alteration of the substrate upon which they are dependent. Does not redirect, delay, or stop the reproductive and feeding movements of fish and crustacea. Considers impacts of process water discharge into water column.	4 Minor increase in benthos due to detritus from fouling organisms on the off-loaders surfaces. Continued disposal of .4 mcy at in-Bay and ocean disposal sites annually.	5 Initial removal of benthos during excavation then periodic burial and recolonization during operations. Increase in benthos populations at basin and edges due to increased turbidity.	3 Initial removal of benthos during excavation then periodic burial and recolonization during operations. Decrease in benthos populations due to confinement.	2 Periodic removal of benthos habitat along 22,300 ft channel in shallow bay and mudflats.	1 Periodic removal of benthos habitat along 40,400 ft channel in shallow bay and mudflats.
Other wildlife species	Avoids loss or change of breeding and nesting areas, escape cover, travel corridors, and preferred food sources for resident and transient wildlife species associated with the aquatic ecosystem. Includes waterfowl (ducks, scaups, grebes, gulls, pelicans, falcons, terns). Avoids bioaccumulation of contaminants in wildlife.	4 May result in nesting or roosting on vertical or surface structures.	5 May confuse diving birds. May increase fish foraging at basin site.	3 May confuse diving birds. May result in nesting or roosting on vertical or surface structures. Confinement may confuse mammal movement.	2 Disruption of mudflats utilized by shoreline and other bird species.	1 Loss of habitat for Salt marsh harvest mouse and California clapper rail along Novato Creek for expanded channel. Disruption of mudflats utilized by shoreline and other bird species.
Habitat acreage	Avoids major alterations or degradation of open water habitats, including eelgrass habitat. *Rank order the alternatives by habitat acreage impacted.* Open water (subtidal) habitats	5 Negligible (0.1 ac)	4 77 ac	4 77 ac	1 119–223 ac	2 71–220 ac
	Mudflat habitats	5 Negligible (0.1 ac)	5 Negligible (0.1 ac)	5 Negligible (0.1 ac)	2 5–11 ac	1 19–66 ac
	Tidal marsh habitats	5 No impact.	5 No impact.	5 No impact.	5 No impact.	1 12–41 ac
	Upland habitats	5 No impact.	5 No impact.	5 No impact.	5 No impact beyond that already planned for BMKV portion of HWRP.	5 No impact beyond that already planned for BMKV portion of HWRP.

Screening Criteria	**Ranking Considerations** *Degree to which alternative attains the criteria dictates ranking 5 through 1.*	Alternative 1: Dredged Material Off-Loader Facility	Alternative 2: Unconfined In-Bay ATF	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin	Alternative 5: Novato Creek Channel to BMKV Basin
Human use characteristics	Preserves existing parks, national and historical monuments, cultural resources, sanctuaries and refuges, wilderness areas, research sites, and similar areas. Does not modify the aesthetic, educational, historical, recreational, and/or scientific qualities, thereby reducing or eliminating the uses for which such sites are set aside and managed.	4 Potential minor visual conflicts with adjacent human uses. Facilitates long-term gain in environmental quality at expansion sites.	5 Small structural footprint would have least impact on adjacent human uses. Facilitates long-term gain in environmental quality at expansion sites.	4 Confinement would have minor impact on adjacent human uses. Facilitates long-term gain in environmental quality at expansion sites.	2 Expansion of 22,300 ft channel would increase vessel traffic and temporarily degrade recreational and environmental values of adjacent human uses. Facilitates long-term gain in environmental quality at expansion sites.	1 Expansion of 40,400 ft channel would increase vessel traffic and temporarily degrade recreational and environmental values of adjacent human uses. Facilitates long-term gain in environmental quality at expansion sites.
Recreational or commercial fisheries and boating	Maintains suitability of recreational and commercial fishing grounds as habitat for populations of consumable aquatic organisms. Avoids chemical contamination of recreational or commercial fisheries. Avoids disruption of significant migration or spawning areas. Does not impair or destroy the resources which support water-based recreational activities, including fishing, boating, scuba diving, etc.	5 Minor conflict with fishing and boating activities; only when project–based vessels and operational activities are occurring. Boats would face change in both resource quality and site access.	4 Small structural footprint would have least conflict with fishing and boating activities. Potential increase in fish populations adjacent to basin site.	4 Confinement would have minor conflict with fishing and boating activities.	2 Potential disruption of duck hunting. However, low impact to other Bay fisheries.	1 Potential disruption of salmonid migration. However, low impact to other Bay fisheries. Potential conflicts with recreational fishing or boating vessels in Novato Creek channel.
Aesthetics	Does not mar beauty of natural aquatic ecosystems by creating distracting disposal sites, inducing inappropriate development, encouraging unplanned and incompatible human access, or by destroying vital aesthetic elements of the study area. Preserves the particular features, traits, or characteristics of an aquatic area that make it valuable to property owners. Considers the geographic footprint of construction/operation facilities visible to the public.	3 Off-loader facility would appear as stationary marine vessel, but would be seen by most only at a distance. Concentration of vessel traffic would occur.	5 No impact due to basin because the ATF basin would be underwater. Concentration of vessel traffic would occur and periodic presence of dredge vessel.	4 Basin confinement and navigation lights would appear as marine/industrial facility to recreational public but would be seen by most only at distance. Concentration of vessel traffic would occur and periodic presence of dredge vessel.	2 Creation of a new 23,300 ft channel to an average 180 ft wide would be visible at low tide. Increased vessel traffic near shoreline would be significant visual change. New levee on BMKV would be visible to Bel Marin Keys residents.	1 Expansion of the existing channels to an average 200 ft wide would be visible at low tide. Increased vessel traffic near shoreline would be significant visual change. New levee on BMKV would be visible to Bel Marin Keys residents.
Air Quality	Results in minimal emissions, particularly NOx and PM10. Avoids emission of criteria air pollutants that exceed federal and state Ambient Air Quality Standards.	3 Diesel emissions; however, would not exceed conformity NOx threshold with emissions controls. Would have emissions for 8 more years.	5 Diesel emissions; however, would not exceed conformity NOx threshold with emissions controls.	5 Diesel emissions; however, would not exceed conformity NOx threshold with emissions controls.	2 Diesel emissions; however, would not exceed conformity NOx standard with emissions controls.	1 Increased vessel traffic (doubled due to channel constraints and scow half-loading) on 40,400-ft channel would emit NOx and PM10.

Screening Criteria	**Ranking Considerations** ***Degree to which alternative attains the criteria dictates ranking 5 through 1.***	Alternative 1: Dredged Material Off-Loader Facility	Alternative 2: Unconfined In-Bay ATF	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin	Alternative 5: Novato Creek Channel to BMKV Basin
Noise	Does not generate excessive noise audible from adjacent upland activities or land uses. Does not exceed City of Novato noise standards for extended periods.	5 Construction and operational noise is minor due to the distance of sensitive receptors to the off-loader facility site.	4 Construction and operational noise is minor due to the distance of sensitive receptors to the basin site.	4 Construction and operational noise is minor due to the distance of sensitive receptors to the basin site.	2 Construction and operational noise may disturb sensitive receptors on HWRP site.	1 Construction and operational noise may disturb sensitive receptors along Novato Creek, and at HWRP site.
Safety concerns	Does not pose public safety hazards by allowing access to equipment sites by unauthorized individuals.	3 Limited potential for recreational boaters to access off-loader facility during idling.	5 No structure footprint for unauthorized access.	1 Sheet piling provides opportunity for unauthorized use by recreational fishers.	3 Access can be controlled	3 Access can be controlled

Chapter 3
Affected Environment

San Francisco Bay conveys waters from California's Central Valley to the Pacific Ocean through the Golden Gate Channel. San Pablo Bay is the northernmost part of San Francisco Bay. At high tide, the surface area of San Pablo Bay is approximately 64,000 acres ([ac] about 25,900 hectares [ha]). Tidal circulation in San Pablo Bay is determined by its connection with the Sacramento–San Joaquin Delta to the east and the central San Francisco Bay and Pacific Ocean to the south and west, respectively.

San Pablo Bay is characterized by extensive mudflat and subtidal mud surfaces and a federal deep-draft navigation channel (the Pinole Shoal Channel) extending from Carquinez Strait to San Pablo Strait. The Pinole Shoal channel is approximately 40,000 feet ([ft] 12,192 meters [m]) long, 600 ft (about 183 m) wide and dredged annually to -35 feet (about -11 m) mean lower low water (MLLW). The existing SF-10[1] disposal site is located within the Pinole Shoal Channel. Unlike the site for the proposed ATF basin, which would be non-dispersive, the SF-10 disposal site is located in an area that is 100% dispersive; meaning that all dredged material deposited at the site is resuspended by currents and settles in other parts of San Pablo and Central San Francisco Bays.

The Petaluma Across the Flats Channel, a smaller federal navigation channel, traverses San Pablo Bay from the Pinole Shoal Channel, northeast across mudflats to the mouth of the Petaluma River. The Petaluma Across the Flats channel is approximately 23,000 ft (about 7,010 m) long, 200 feet (about 61 meters) wide, and is dredged every 3 to 4 years to -8 feet MLLW (-10 feet [about -3 m] with allowed 2-ft [0.6-m] overdredge). The mudflats outside of these channels slope gently upwards through the tidal range to San Pablo Bay's shoreline. Average depths are less than 6 feet (about 1.8 m) over much of San Pablo Bay. The shoreline fringe is primarily tidal marsh, whose width varies from just a few feet (perhaps a meter) in some locations, to several hundred feet (more than 100 m) along the Bay's northern shoreline. The HWRP and BMKV sites are located just west of this shoreline fringe and are both isolated from San Pablo Bay by an outboard levee.

The Pinole Shoal Channel and SF-10 in-Bay disposal site form the eastern boundary of the project area, while the tidal marsh fringe and outboard levee that line the HWRP and BMKVsites generally form the western edge (see Figures 1-1 and 1-2 in Chapter 1, *Purpose and Need*).

3.1.1 Definition of Project Area

As mentioned, the scope of this SEIS/EIR is limited to the project footprint area of central and western San Pablo Bay that may be affected by the proposed action and alternatives. For some

[1]SF-10 is an existing, in-Bay dredged material disposal site located approximately 3 miles northeast of Point San Pedro in San Pablo Bay (see detailed description of this site in Section 3.1, below).

resource topics (e.g., circulation and sedimentation, marine biology, marine transportation, and air quality), this document also discusses conditions in the larger San Francisco Bay and/or Sacramento-San Joaquin Delta.

The following summary description of the project area to frames the discussion of the affected environment, which is discussed in detail in the following Sections 3.1 through 3.15.

- **Alternative 1— No Action**. Under Alternative 1, the existing, authorized dredge material off-loader facility would remain located near the existing SF-10 disposal site in San Pablo Bay. The project area extends from the SF-10 vicinity along the delivery pipeline alignment across shallow bay and mudflats to the west approximately 28,000 feet (about 8,534 meters) to the BMKV site. Currently, the authorized off-loader facility, booster pump station, and dredged material transfer pipeline is in place to convey dredged material from the Oakland -50 Foot Navigation Improvement Project. All or portions of the structures may be left in place following construction of the Oakland -50 -Foot project; should any structures remain, it is expected that they would be utilized as components of Alternative 1.
- **Alternative 2—Unconfined In-Bay ATF (Proposed Action).** Under Alternative 2, the proposed ATF basin would be excavated near the existing SF-10 disposal site in San Pablo Bay. All or portions of the booster pump station and dredged material transfer pipeline currently in place may be utilized as components of Alternative 2. The project area extends from the SF-10 vicinity along the delivery pipeline alignment across shallow bay and mudflats to the west approximately 28,000 feet (about 8,534 meters) to the HWRP site.
- **Alternative 3—Confined In-Bay ATF.** Under Alternative 3, the proposed ATF basin and a confining wall would be constructed near the existing SF-10 disposal site in San Pablo Bay. All or portions of the booster pump station and dredged material transfer pipeline currently in place may be utilized as components of Alternative 3. The project area extends from the SF-10 vicinity along the delivery pipeline alignment across shallow bay and mudflats to the west approximately 28,000 ft (about 8,534 m) to the HWRP site.
- **Alternative 4—Direct Channel to BMKV Basin.** Alternative 4 involves dredging an approximate 22,300-ft-long (about 6,797-m-long), 180-ft-wide (about 55-m-wide) direct channel across existing mudflats from the vicinity of the existing SF-10 in-Bay disposal site to the BMKV site. The project area includes shallow bay and mudflat habitat surrounding the direct channel alignment, as well as the rehandling basin excavated from the upland BMKV site. Following excavation of the BMKV basin, the outboard levee would be breached to allow tidal access between the BMKV basin and the direct channel.

Section 3.1
San Francisco Bay Dredging

The following section provides a brief overview of the existing maintenance dredging projects, dredged material placement sites, and operating equipment used in the San Francisco Bay Area.

3.1.1 Existing Maintenance Dredging Projects in San Francisco Bay

There are 14 federal and approximately 93 non-federal maintenance dredging projects in the San Francisco Bay Area. As presented in Table 2-2, material dredged from federal channels and non-federal dredging projects are or will be beneficially used to restore wetlands at the HWRP site. It is anticipated that any of the alternatives would accept material from any of the dredging projects in San Francisco Bay, as long as the HWRP site can accept the material (e.g., there are no logistical reasons preventing material from being placed at the HWRP site), the dredged material complies with the waste discharge requirements (WDR) of the Regional Water Quality Control Board (RWQCB) and the Biological Opinion (BO) from the U.S. Fish and Wildlife Service (USFWS) currently in place for the HWRP (see Table 2-4).

3.1.2 Existing Aquatic Dredged Material Placement Sites

This section discusses the existing in-Bay and ocean disposal sites: SF-9, SF-10, SF-11, and SF-16, and SF-8 and SF-Deep Ocean Disposal Site (DODS), (see Figure 2-1 in Chapter 2, *Description of Alternatives*). Operation of the proposed ATF or alternatives would reduce (though not eliminate) use of these existing dredged material disposal sites and the associated impacts to water quality and marine biology. Table 3.1-1 provides an overview of the annual disposal volumes at these sites, and Table 3.1-2 summarizes the permitted volumes at designated disposal sites.

Table 3.1-1. Dredged Material Placement Volumes at Existing In-Bay and Ocean Disposal Sites

	Aquatic Disposal Volumes Under the LTMS (nearest 1,000 cubic yards [cy])								
Site	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**Average**
SF-8/OB[1]	667	78	268	378	233	507	382	374	**361**
SF-9	103	257	200	307	43	114	122	43	**149**
SF-10	25	386	103	249	184	148	432	292	**227**
SF-11	871	1,269	1,076	1,114	871	1,086	1,119	712	**1,015**
SF-16	59	130	510	369	216	126	145	202	**220**
SF-DODS[2]	381	697	898	1,052	341	150	1,078	1,426	**753**
Total	2,106	2,817	3,055	3,469	1,888	2,131	3,278	3,049	**2,724**

Source: DMMO Annual Reports (for all sites except SF-DODS)

[1] Total for SF-8 + Ocean Beach volume MSC plus other SF-8 (3-mile [mi] limit portion) projects

[2] Source: Germano et al. 2008 (In prep)

Table 3.1-2. Permitted Dredged Material Volumes at Existing In-Bay and Ocean Disposal Sites

Disposal Site Name	Maximum Total Volume	Maximum Rate of Receipt
SF-8 (Bar Channel)	None	N/A
SF-9 (Carquinez Straits)	2.0 mcy/year (wet years) 1.0 mcy/year (dry years)	1.0 mcy/month
SF-10 (San Pablo Bay)	500,000 cy/year	500,000 cy/month
SF-11 (Alcatraz Island)	4.0 mcy/year	400,000 cy/month (Oct–May) 300,000 cy/month (Jun–Sept)
SF-16 (Suisun Bay)	200,000 cy/year	N/A
SF-DODS	4.8 mcy/year	N/A

3.1.2.1 SF-8 (Bar Channel)

SF-8 is an ocean disposal site located 7,500 feet (about 2,300 meters [m]) south of the San Francisco Bar Channel in the Pacific Ocean. SF-8 is a 15,000-long by 3,000-foot-wide (about 4,572-long by 914-m-wide) rectangle disposal site. Disposal at this site is limited to sandy material dredged from the federally authorized Main Ship Channel (and non-federal projects with clean sand) and there is no set limit on the disposal volumes allowed. The easternmost portion of SF-8 is within the 3-mi limit (4.8-kilometer [km] limit), as such sandy material from the Main Ship Channel is regulated under the CWA for beneficial use to nourish portions of the Ocean Beach. The trapezoidal portion of SF-8 that is within the 3-mi limit is approximately 3,000 feet long by 430 feet (about 914 by 131) at its northern end and 1,000 feet wide (about 305 m) at its southern end.

3.1.2.2 SF-9 (Carquinez Strait)

The SF-9 in-Bay disposal site is located approximately 0.9 mi (about 1.5 km) west of the entrance to Mare Island Strait in eastern San Pablo Bay. SF-9 is a 1,000 by 2,000 foot (about 305 by 610 m) rectangular dispersive disposal site that covers approximately 46 ac (about 19 hectares [ha]). It is authorized to receive 1.0 million cubic yards (mcy) (about 0.8 million cubic meters [Mm^3]) of dredged material any one month, with limitations set at 2.0 mcy/year (1.6 Mm^3) in wet years and 1.0 mcy/year (0.8 Mm^3) in dry years.

3.1.2.3 SF-10 (San Pablo Bay)

The SF-10 in-Bay disposal site lies approximately 3.0 mi (4.8 km) northeast of Point San Pedro in San Pablo Bay. SF-10 is a 1,500 by 3,000 foot (about 450 by 900) rectangular site that totals 103 ac (42 ha). Due to strong tidal currents in this location, the site is dispersive, meaning that dredged material placed at the site is redispersed to other areas of San Pablo and Central San Francisco Bays. SF-10 is authorized to receive up to 500,000 cy/year (382,000 cubic meters [m^3]/year), which can happen in a single month, if necessary.

The transfer facilities proposed under Alternatives 1, 2, and 3 would be located in the vicinity of the SF-10 in-Bay disposal site. The proposed direct channel under Alternative 4 would extend from the vicinity of the SF-10 site to the BMKV basin site.

3.1.2.4 SF-11 (Alcatraz Island)

SF-11 is located 0.3 mi (0.5 km) south of Alcatraz Island in Central San Francisco Bay. The site is a 1,000-foot radius (about 3,000) circular disposal area that totals approximately 72 ac (29 ha). It is authorized to receive a maximum of 4 mcy (3 Mm^3) annually. SF-11 has monthly dredged material disposal limits of 400,000 cy (306,000 m^3) from October through May and 300,000 cy (about 229, 400 m^3) from June through September.

3.1.2.5 SF-16 (Suisun Bay)

Restricted to the receipt of material from federal (USACE-sponsored) projects, the SF-16 in-Bay disposal site is located 0.7 mi (1.1 km) north of the Suisun Bay Channel. SF-16 is a 500 by 11,200 foot (150 by 3,400 m) rectangular site totaling 128 ac (52 ha). As with the other in-Bay disposal sites, this site was chosen for its dispersive capabilities to prevent hazardous mounding. Currently, SF-16 is authorized to receive 200,000 cy (153,000 m^3) of dredged material per year.

3.1.2.6 SF-DODS (San Francisco Deep Ocean Disposal Site)

Located approximately 49 nautical mi (91 km) west of the Golden Gate Bridge, SF-DODS is the deepest (8,200 to 8,900 feet deep [about 2,500 to 2,700 meters]) and farthest offshore disposal site in the nation. The Environmental Protection Agency (EPA) designated SF-DODS for dredged material disposal in a Final Rule published August 11, 1994 (59 Federal Register 41243, 40 Code of Federal Regulations [CFR] 228.15(1) (3)), amended in 1996 and 1999. The 1994 Final Rule contains a Site Management and Monitoring Plan that includes goals and objectives for tiered environmental monitoring activities. Disposal is regulated and limited to 4.8 mcy (3.7 Mm^3) of dredged material per year.

To date, well over 10 mcy (7.7 Mm^3) of dredged material has been diverted from in-Bay disposal sites and placed in SF-DODS, thus reducing risks of disposal-related impacts on sensitive estuarine waters. The location of SF-DODS was chosen based on evaluation of data collected from extensive oceanographic and benthic field studies and computer modeling of disposal characteristics, in order to assure that no adverse impacts on marine resources would occur.

3.1.3 Beneficial Use Sites

This section discusses of beneficial use sites within San Francisco Bay. These sites allow for beneficial use of dredged material to restore wetlands, maintain levees, at existing sanitary landfills, and for general construction uses. The following beneficial use sites are currently in use in the region.

- The Montezuma Wetlands Project is a privately owned and operated site that began accepting dredged material in July 2003. The site is located adjacent to Montezuma Slough in Solano County. The imported material is being beneficially used to create tidal wetlands and the site will be accepting material for many years. The site has all required permits and can accept both cover and foundation quality material (as described in the RWQCB's Draft Beneficial Reuse Guidelines). The site has deep-water access, as well as a docking area and off-loading equipment.
- The HWRP will beneficially use approximately 24.4 mcy (18.7 Mm^3) of dredged material to restore 2,526 ac (about 1,022 ha) of wetlands and other habitats. Utilizing the *Liberty* off-loader, the site has already accepted approximately 170,000 cy (130,000 m^3) of dredged material at low-lying areas.
- Bair Island is located in South San Francisco Bay across Redwood Creek from the Port of Redwood City in San Mateo County. Bair Island is now owned by public agencies and is planned for habitat restoration. The USFWS and USACE are planning to place approximately 225,000 cy (172,000 m^3) of material at the site from the next maintenance dredging of the Redwood City federal channel in Fiscal Year 2008.
- Winter Island is a privately owned and operated site located at the confluence of the Sacramento-San Joaquin Delta and Suisun Bay in Contra Costa County. Dredged material is imported onto the site to re-nourish the island and maintain 5 mi (8 km) of perimeter levees. Although this site is currently closed, it has the capacity to take up to 200,000 cy (153,000 m^3) of material each year, but only 50,000 cy (38,000 m^3) can be sand. The site is permitted by the RWQCB and has specific dredged material acceptance criteria established in its Waste Discharge Requirements (WDR) permit.
- Van Sickle Island is a 2,362-ac (about 956-ha) island located on the eastern edge of the Sacramento-San Joaquin Delta, north of the Stockton Deepwater Ship Channel and within Suisun Marsh in Solano County. The site is privately owned and operated by Reclamation District 1607 and is currently authorized to accept approximately 6,000 to 8,000 cy (4,500 to 6,000 m^3) of dredged material per year for levee restoration. The owners of the site are requesting permission to expand the operation to accept 500,000 to 1,000,000 cy (about 382,000 to 765,000 m^3) over a 10-year period to rehabilitate failing portions of the 7.1 mi (11.4 km) of levees surrounding the island.

- The Carneros River Ranch is located near the mouth of the Petaluma River, in the Sears Point area of unincorporated Sonoma County. The beneficial use site is approximately 540 ac (about 219 ha) of low-lying agricultural fields where hay is farmed. The area was formerly baylands, but was diked and drained in the late 1800s. Material dredged from the Port of Sonoma and Bel Marin Keys North Lagoon is placed in the North West and North Central Fields to raise the elevations of the fields by approximately 2 feet (about 0.6 meter). To date, approximately 600,000 cy (about 459,000 m^3) of dredged material has been beneficially used.
- The Middle Harbor Enhancement Area Project (MHEA), completed in 2008, utilized dredged material from the Oakland Inner and Outer Harbor Channels to create approximately 190 ac (77 ha) of wetland habitat in the Port of Oakland's Middle Harbor, near the former Navy Berths. The MHEA is an ecological reserve of shallow bay and shoreline habitats that support commercial species, such as Dungeness crab, bottom fish, anchovy, herring, and perch. The calm, clear waters of this area will be planted with eelgrass and will support a diverse variety of species.
- USACE currently manages a nearshore beneficial use demonstration site (near Ocean Beach) located approximately 0.75 mi (about 1.2 km) offshore from Ocean Beach near Sloat Boulevard. The demonstration site is within the San Francisco Bar littoral cell, offers nearshore beneficial use opportunities for clean, sandy material, and may ultimately help mitigate ongoing shoreline erosion in the area south of Sloat Boulevard that threatens municipal infrastructure (including segments of the Great Highway). To date, USACE has completed two pilot projects.
- Other beneficial reuse sites include: Kennedy Park in Napa; San Leandro Ponds; Schollenberger Park in Petaluma, and the Martinez Marina drying ponds.

Once dried, the clays and fine silts that comprise most dredged materials from San Francisco Bay are often suitable for beneficial use at landfill sites as cover, onsite construction, capping, or lining material. Because landfills are designed to contain pollutants and manage runoff, they have the added benefit of being able to accept some contaminated materials infeasible for unconfined aquatic disposal.

Rehandling facilities are mid-shipment points for dredged material that cannot be hauled directly to the site where it will be ultimately used. They are also locations where dredged materials can be dried or treated to remove or reduce salinity or contaminants. Typically, rehandling facilities accept relatively small volumes of material originating from specific dredging projects. In the San Francisco Bay Area, rehandling facilities are located at Port Sonoma-Marin near the mouth of the Petaluma River; the City of Petaluma in Sonoma County; Port of San Francisco Berth 94/96 in San Francisco County; Port of Oakland Berth 10 in Alameda County; and in the City of San Leandro in Alameda County.

Section 3.2
Geology and Seismicity

3.2.1 Existing Conditions

Existing conditions information presented below was compiled by reviewing relevant technical reports and maps published by the U.S. Geological Survey, the California Division of Mines and Geology (now the California Geological Survey), and the Seismological Society of America.

3.2.1.1 Regional Conditions

Geology

Regional geologic maps and reports of San Francisco Bay indicate that the project area is underlain by Bay Mud deposits on top of a more stable basement formation called the Franciscan Assemblage. Bay Mud can be subdivided into Old Bay Mud (Qobm) and Young Bay Mud (Qybm), the former being chronologically the older formation of the mud, although both were deposited in the Quaternary period. The Old Bay Mud formations are primarily composed of over-consolidated, very stiff to hard clays and silts, while the Young Bay Mud layer contains normally consolidated, soft to stiff clays and silts (California Division of Mines and Geology 1969; Barends 1999). Because they exhibit a high degree of plasticity, bay mud deposits can be highly susceptible to settlement or plastic flows when subjected to large, sustained loads (Goldman 1969; Jones & Stokes 2003a; Jones & Stokes 2003b).

Due to the lack of geologic boring samples in the immediate area surrounding the project area, stratigraphic characterizations of both Old Bay Mud and Young Bay Mud must be estimated using interpolation from existing maps and reports created by the California Division of Mines and Geology (1969) and from borings done in San Pablo Bay by USACE and the State of California (1963).

Based on these interpolations, the thickness of Young Bay Mud at the project area is likely to be in the range of 50 to 70 feet ([ft] about 15 to 21 meters [m]). However, push-borings performed by the State of California (1963) offshore and north of the mouth of the Gallinas River indicate a thickness of as little as 16 ft (about 5 m). This sample may be unrepresentative of the conditions since other borings performed in the vicinity correspond more with the interpolated thickness. Additionally, the Young Bay Mud layer may be thicker in the western portion of San Pablo Bay due to the possibility that the Suisun Bay channel was located in a more north-by-northwest orientation at the end of the Wisconsin (most recent) glaciation, which would have introduced large amounts of young material into the Bay. A reasonable estimate for the thickness of the Old Bay Mud unit at the project area is approximately 40–60 ft (about 12–18 m) where it contacts the bedrock of the Franciscan Formation.

Seismicity and Seismic Hazards

The project area is located in one of the most seismically active regions of California. Primary and secondary seismic hazards in the project area are described below.

Fault Rupture Hazard

The most recent statewide fault activity map issued by the California Geological Survey indicates that there are no active or potentially active faults located within the project area (Jennings 1994). The closest active faults shown on the statewide map are the northernmost segment of Hayward Fault Zone, located immediately southeast of the project area; the southernmost segment of the Rodgers Creek Fault Zone, located a few miles north of the project area; and the San Andreas Fault Zone, located approximately 20 miles ([mi] about 32 kilometers [km]) west of the project area. More recent fault investigations suggest that the Hayward Fault actually passes beneath San Pablo Bay a few miles east of the proposed ATF (Parsons et al. 2003). There are also two other potentially active faults; the Tolay Fault zone approximately 10.4 mi (16.7 km) directly north of the proposed ATF site and the Burdell Mountain Fault approximately 6 mi (about 10 km) north by northwest of the site. The Tolay Fault was subjected to displacement of several thousand feet during the Pliocene epoch (Ford 1975) and may still be active (Robert Bein, William Frost & Associates 1995 cited in USACE 1998). Some evidence suggests activity on Burdell Fault as recently as the Holocene (current) epoch (Environmental Science Associates 1993 cited in USACE 1998). Since the actual project site is not located directly on a fault mapped by USGS that is shown to be active in the Quaternary period (approximately 1.8 million years ago [mya]), it is very unlikely that the proposed action is at risk from a fault rupture.

Ground Shaking Hazard

In 1996, the California Geological Survey released a probabilistic seismic hazard assessment to aid in the assessment of seismic ground-shaking hazards in California (Peterson et al. 1996). The report contains a probabilistic seismic hazard map that depicts the peak horizontal ground acceleration values exceeded in a given region of California at a 10% probability in 50 years (i.e., 0.2% probability in 1 year). The peak horizontal ground acceleration (PGA) values depicted on the map represent probabilistic estimates of the ground-shaking intensity likely to occur in a given area as a result of characteristic earthquake events on active faults, and can be used to assess the relative seismic ground shaking hazard for a given region. The probabilistic ground shaking hazard maps for California were recently updated to incorporate new seismic information (Cao et al. 2003).

The PGA value assigned to the project area is greater than 0.8g (“g” = acceleration due to gravity) (California Geological Survey 2002), indicating that the ground shaking hazard in the project area is extremely high, ranking among the highest in the state. This high PGA value is due largely to the close proximity of the project area to known active fault zones such as the Hayward, San Andreas, and Rogers Creek Fault Zones.

Liquefaction Hazard

Liquefaction is a process by which soils and sediments lose shear strength and fail during episodes of intense seismic ground shaking. Liquefaction typically occurs in areas where groundwater is shallow and materials consist of clean, poorly consolidated, fine sands and silts. The susceptibility of bay mud deposits to liquefaction is variable and depends on particle size distribution. Bay mud deposits are often not susceptible to liquefaction because they typically do not contain appreciable quantities of clean sands and silts (Jones & Stokes 2003a; Jones & Stokes 2003b), but the most recent regional liquefaction susceptibility report published by the U.S. Geological Survey characterizes bay mud deposits as being moderately susceptible to liquefaction (Witter et al. 2006).

Section 3.3
Circulation and Sedimentation

3.3.1 Existing Conditions

The following discussion focuses primarily on San Pablo Bay, which may be affected by construction of the proposed action and alternatives. Please refer to the 2003 BMKV SEIS/EIR for a discussion of conditions at the BMKV site, where a proposed transfer basin would be located under Alternative 4.

3.3.1.1 Regional Hydrology and Hydraulics

San Francisco Bay

San Francisco Bay is downstream of the Sacramento–San Joaquin Delta (Delta), where the confluence of two major California rivers meet, the Sacramento and the San Joaquin. San Francisco Bay serves as the only drainage outlet for the Central Valley, draining approximately 40% of California's surface area (San Francisco Estuary Project 1999). San Francisco Bay conveys waters from the Central Valley to the Pacific Ocean through the Golden Gate Channel, and can be divided into several areas: Suisun Bay, Carquinez Straight, San Pablo Bay, Central Bay, and South Bay (see Figure 3.3-1). Suisun Bay is a shallow bay located at the western boundary of the Delta and the eastern end of the Carquinez Strait. Suisun Marsh, associated with Suisun Bay, is the largest brackish marsh in the United States (USACE et al. 1998). Carquinez Strait is a narrow 12-mi-long channel that connects Suisun and San Pablo Bays. San Pablo Bay encompasses the area from Carquinez Straight to the San Pablo Strait north of the Richmond–San Rafael Bridge. The Central Bay extends from San Pablo Bay to the north, the Oakland–San Francisco Bay Bridge to the south, and the Golden Gate Bridge to the west. The South Bay encompasses all waters south of the Oakland–San Francisco Bay Bridge. The proposed project and alternatives would be located in San Pablo Bay and may influence the other areas of San Francisco Bay as well.

Circulation in San Francisco Bay is largely controlled by tides, winds, salinity, and bathymetry with variations daily and seasonally. Water flow patterns of the North Bay differ from those of the South Bay. The North Bay is heavily influenced by seasonally varying freshwater flows from the Delta. The South Bay is a lagoon-type estuary that is influenced by exchange between the ocean and the North Bay.

San Francisco Bay has two daily tidal cycles, consisting of two low and two high tides. Average high tide elevation values are referred to as mean higher high water (MHHW) and mean high water (MHW). Similarly, low tide values are referred to as mean low water (MLW) and MLLW. An average of 1.3 million ac-feet of water (1,600 m^3), or 24% of the Bay and Delta's volume, moves in and out San Francisco Bay/Delta during each tidal cycle (USACE et al. 1998). Due to geographic and hydrodynamic complexities, tidal characteristics, including the elevations of average high, low, and mean tides, differ substantially throughout the San Francisco Bay system. Tide cycles in San Pablo Bay typically lag behind those at the Golden Gate by as much as 75 minutes (USACE et al. 1998). It can take 2 hours for the tides to be felt at the furthest end of the South Bay and 8 hours to be felt in Sacramento, at the uppermost end of the Delta (USACE et al., 1998). Tidal currents are stronger in the channels and weaker in the shallows.

Circulation and mixing patterns are influenced by strong seasonal winds. In shallow areas of the Bay, such as in San Pablo Bay, wind-generated waves cause sediment to become resuspended into the water column. It has been estimated that 100 to 286 mcy (about 76 to 219 Mm^3) of sediments are resuspended annually in San Francisco Bay due to wind actions (USACE et al. 1998).

Freshwater from the Delta is less dense than saltwater from the ocean. Consequently, freshwater flows in a layer above saltwater, creating a vertical salinity gradient. Freshwater flowing downstream from the Delta meets upstream-flowing saltwater in a pattern known as gravitational circulation. Gravitational currents are generally weaker than tidal currents. However, they significantly contribute to sediment cycling in San Francisco Bay. Freshwater flows carry sediment loads downstream where suspended sediments settle out near the bottom. The counter-flowing gravitational circulation of the saltwater layer then carries fine sediments upstream. This sediment cycle reverses when freshwater flows carry the fine suspended sediments back downstream.

San Francisco Bay has an average depth of 19 feet (about 6 m) at MLLW and a median depth of about 6 feet (Conomos et. al. 1985). Average depth of the Central Bay is 43 feet (about 13 m), while depths of the South and North Bays range between 15 and 17 feet (about 4.5 and 5 m). San Francisco Bay's deepest point of 360 feet (about 110 m) is found under the Golden Gate Bridge. The Carquinez Straight is approximately 88 feet deep (about 27 m) (SFEP 1999).

San Pablo Bay

San Pablo Bay is the northernmost embayment of San Francisco Bay. At high tide, the surface area of San Pablo Bay is approximately 64,000 ac (25,899 ha). Tidal circulation in San Pablo Bay is determined by its connection with the Delta to the east and the Central Bay and Pacific Ocean to the south and west. Circulation patterns in San Pablo Bay are dominated by tidal circulation, river discharge, and winds. The current pattern is generally in a clockwise direction from Point San Pedro towards the Petaluma River, resulting from both tidal and fluvial forces, combined with a Coriolis effect. Water currents are greatest in the deeper portions of the Bay, such as the Pinole Shoal Channel. In general, depth-averaged velocities range from 0 to 1 knots in most of San Pablo Bay, with values greater than 3 knots during peak tidal flows in the deeper areas (see Figure 3.3-2).

More than 90% of the freshwater inflow to San Pablo Bay arises from the Sacramento and San Joaquin River systems and enters through Carquinez Strait. The combined flow of these rivers averages approximately 32,000 cubic feet per second (cfs) (906 m^3/second [s]) during the winter months and averages approximately 6,000 cfs (170 m^3/s) during the summer months (California Department of Water Resources 1993). Other minor sources of freshwater inflow include the Petaluma River, the Napa River and Sonoma Creek/Second Napa Slough. Freshwater inflow primarily occurs during winter rains, spring snowmelt runoff, and reservoir releases. This freshwater inflow has an extensive influence on current patterns, vertical mixing, and constituent transport patterns within San Pablo Bay. During periods of high inflow, San Pablo Bay becomes well mixed, and salinity stratification and intrusion are diminished.

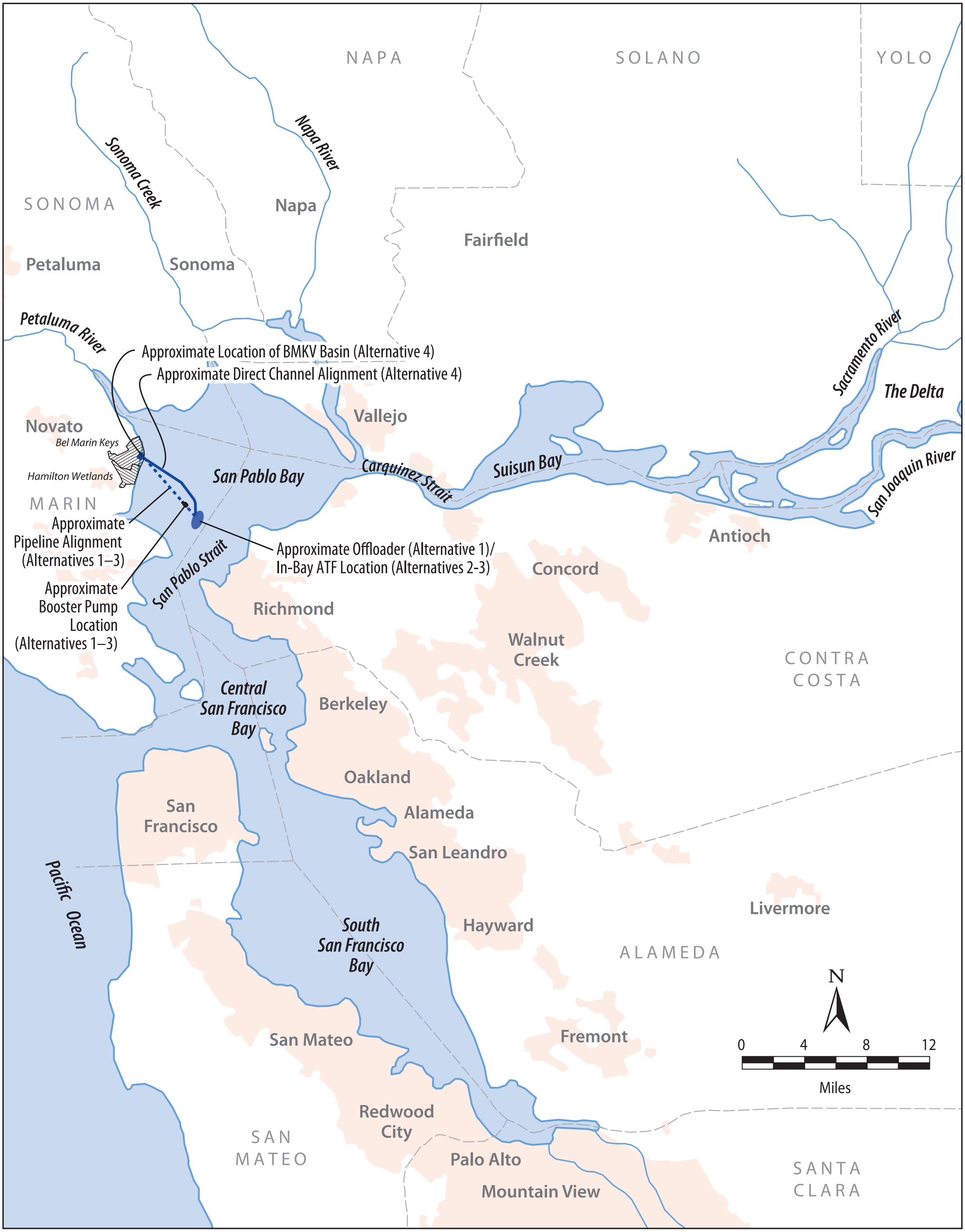

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Figure 3.3-1
Surface Waters

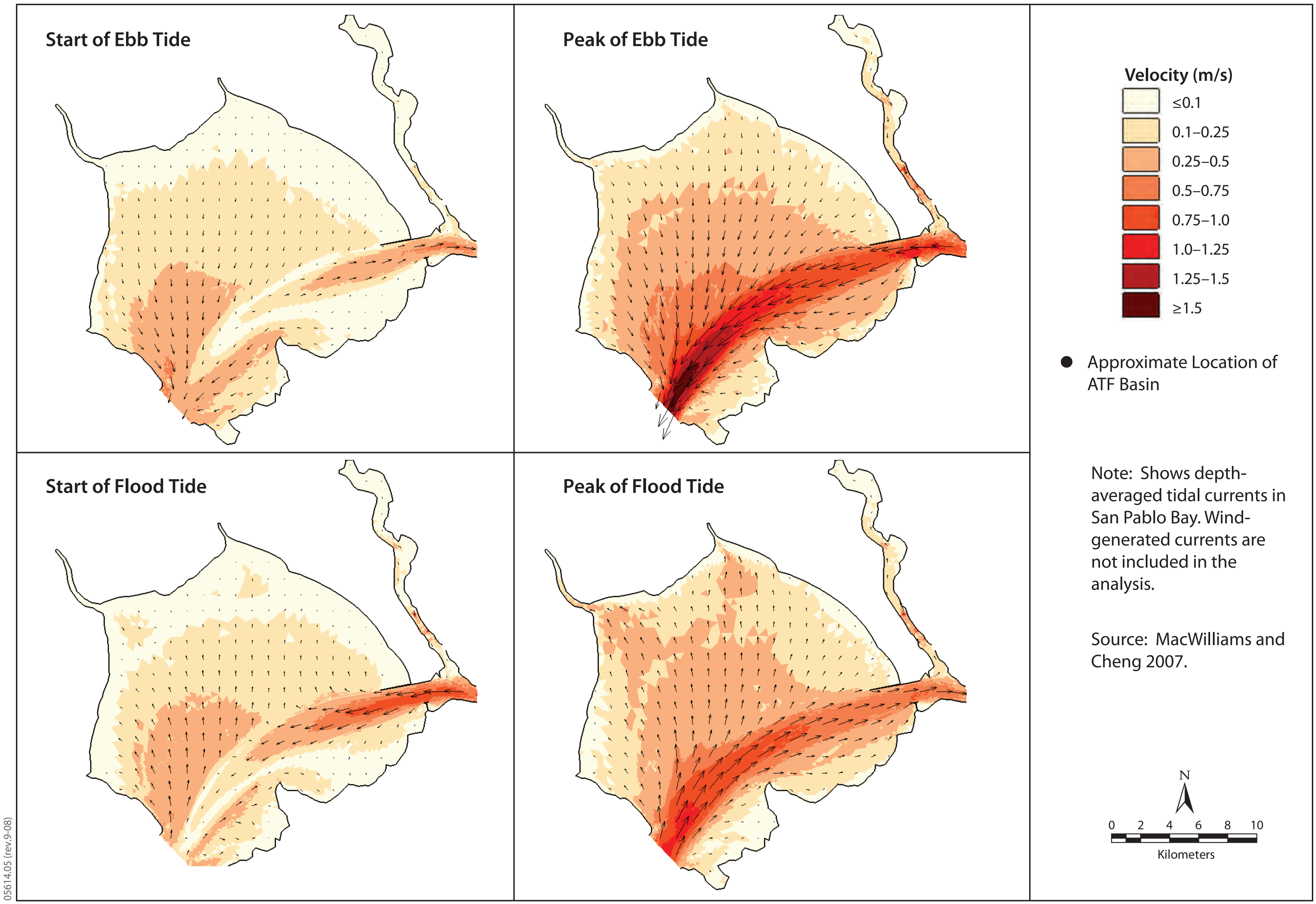

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Figure 3.3-2
Typical Depth-Averaged Velocity in San Pablo Bay

The morphology of San Pablo Bay is characterized by extensive mudflat and subtidal mud surfaces and a primary 30- to 40-foot-deep channel (about 9 to 12 m the Pinole Shoal Channel) extending from Carquinez Strait to San Pablo Strait (see Figure 3.3-3). The Pinole Shoal Channel is dredged annually by USACE for deep draft navigation to the ports of Richmond, Mare Island, Pittsburg, Antioch, Stockton, and Sacramento. A smaller channel, the Petaluma across the Flats Channel, which is dredged periodically, is approximately 11.5 feet (3.5 m) deep at MLLW and traverses the mudflats from the mouth of the Petaluma River to the primary channel. The mudflats outside of these channels slope gently upwards through the tidal range to San Pablo Bay's shoreline. Average depths are less than 6 feet (1.8 m) over much of the mudflat and subtidal mud surfaces. The shoreline fringe is primarily tidal marsh, with widths that vary from less than 100 feet (about 30 m) or even nothing in many locations, to several hundred feet along the Bay's northern shoreline.

Winds over San Pablo Bay are typically from the northwest and southeast, and average 10–15 miles per hour (mph) (16-24 kilometers/hour [km/h]), with velocities exceeding 20 mph (32 km/hr) only 10% of the time. Wind-generated waves develop in response to the wind patterns, with resultant wave height and wave period being a function of fetch length (the distance wind blows over open water) and water depth. Resultant wave periods of 2–5 seconds are reported as typical for conditions in San Pablo Bay.

3.3.1.2 Sediment Conditions

Materials beneath San Francisco and San Pablo Bays in particular consist of thick, unconsolidated sediments of both marine and terrestrial origin, deposited from the Pleistocene to the present day. The trough-like depression that underlies San Francisco Bay is formed by Franciscan sandstone and shale bedrock. This trough is nearly filled with sediments, some of which have come from erosion of upland watersheds, and some of which consist of later marine deposits. Sediments present in the project area fall into two categories: sandy bottoms in the channels and soft deposits (known as "bay mud") underlying areas of shallower water. Regions where currents are strong, such as the Pinole Shoal Channel, generally have coarser sediments (i.e., fine sand, sand, or gravel). Areas where current velocities are lower are covered with bay mud. The surface bay muds ("Young Bay Mud") and recent sand deposits tend to be much less densely packed, have greater pore space and hence are high in moisture content, and are higher in organic carbon than the underlying ancient sediment formations ("Old Bay Mud").

Historic Changes in Sediment Budget

During pre-1850 conditions, sediment supply to San Francisco Bay appears to have been lower than under current conditions. Inflow of sediment to San Francisco Bay was relatively low due to low sediment production in the San Joaquin and Sacramento watersheds and higher net deposition in the Delta due to a larger marsh plain area.

Figure 3.3-3 shows changes in bathymetry in San Pablo Bay from 1856 through 1983.

During the period following hydraulic mining in the Sierras there was large accretion within San Pablo Bay (1856-1887). Sediment supply changed significantly in the mid- to late-1800s due to the discovery of gold and resulting hydraulic mining in the Sierra Nevada. Agricultural and urban development during this period also contributed to the disturbance of soils and increased erosion. Reclamation of marsh areas, particularly in the Delta, reduced the amount of sediment captured in the

Delta. The result during this period was an increase in mudflat and tidal marsh area in San Pablo Bay and other parts of San Francisco Bay.

Starting in 1929, large-scale water diversions, which also diverted sediment, further reduced sediment loading to the Bay. By the middle of the 20th century, the Delta sediment inflow had reduced by more than half. Sediment production in the watersheds had been reduced, and the trapping of sediment by reservoirs had increased. Reservoirs also reduced winter floods, diminishing their sediment transport capacities (Phillip Williams & Associates 2002).

During more recent time San Pablo Bay has undergone net loss of sediment in the shallow areas and net gain along the fringes of Pinole Channel (1951–1983).

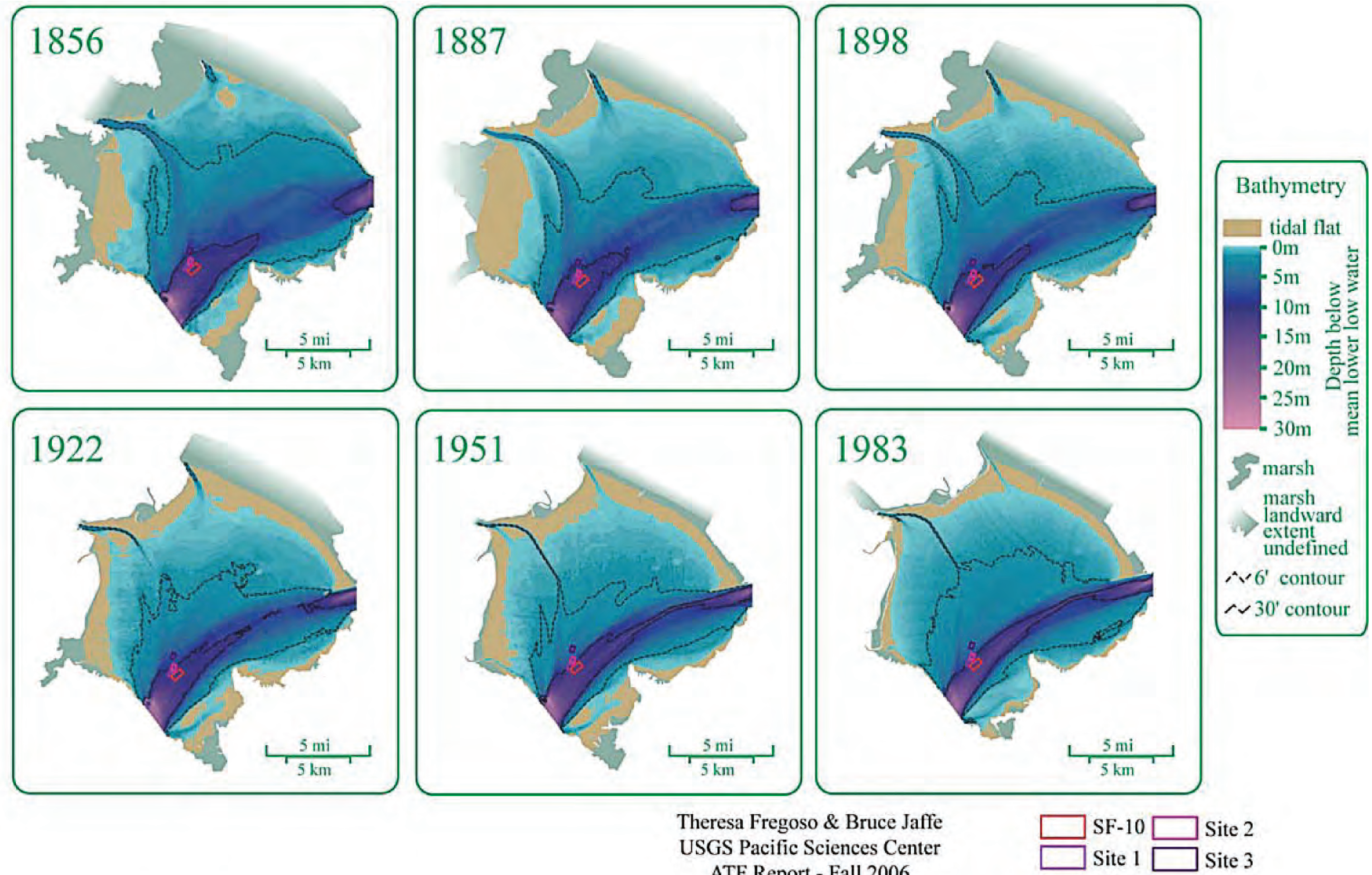
Historical sediment erosion and accretion patterns in San Pablo Bay from 1856 to 2006 are shown in Figure 3.3-4. It should be noted that the sedimentation patterns during the period 1983-2006 were only estimated for the region near the proposed ATF site because the bathymetric survey carried out in 2006 was specifically undertaken only within the project area for the proposed action.

Existing Sediment Budget of San Francisco Bay

The sediment budget of San Francisco Bay is an accounting of sediment inflows, outflows, and change in storage within the zone of tidal influence. The sediment inflow minus outflow must equal the change in storage. Inflows to San Francisco Bay include discharges from the Central Valley to the Delta and discharges from San Francisco Bay watershed. Outflows include irrigation diversions by water withdrawals in the Delta (which captures sediment), discharges to the Pacific Ocean through the Golden Gate, and dredged material placement outside San Francisco Bay (upland or deep ocean disposal). Changes in sediment storage occur from deposition within sediment sinks where sediment is either temporarily or semi-permanently trapped (e.g., filling of channels, restored tidal marsh areas, and reduction of tidal marsh and flats due to historic sea level rise).

Schoellhamer et al. (2005) calculated the sediment budget for San Francisco Bay considering inflows from the Pacific Ocean, Delta, and local tributaries and outflows to the ocean, sand mining, wetland deposition, and out-of-Bay disposal. Their calculations show that San Francisco Bay is erosional, experiencing an average net outflow of 1.4 million metric tons per year ([MMT/yr] 1.5 million tons per year [mt/yr]) of sediment during the period of 1955 to 1990 (see Table 3.3-1, Schoellhamer et al. 2005). Comparatively, the sediment budget calculated for the period of 1995 to 2002 indicates that San Francisco Bay became increasingly erosional, with an increase in sediment outflow to 1.84 MMT/yr (2 mt/yr) (Schoellhamer et al. 2005). In both periods, inflows of ocean sand were the largest sediment input, and sediment outflow to the ocean was the largest output. The budgets indicate that for the period 1995–2002, there was an increase in sediment inflows, but an even larger increase in sediment outflow due to upland disposal and sand mining.

PWA (2002) also estimated that San Francisco Bay was erosional from 1955 to 1990 with an estimated average net outflow of approximately 1.4 MMT/year ([1.5 mt/yr] assuming bulk density of sediment as 1 MMT = 1.8 Mm^3 of sediment from San Francisco Bay). Figure 3.3-5 shows estimated annual average sediment flows calculated by PWA.



Source: Jaffe and Fregoso 2007.

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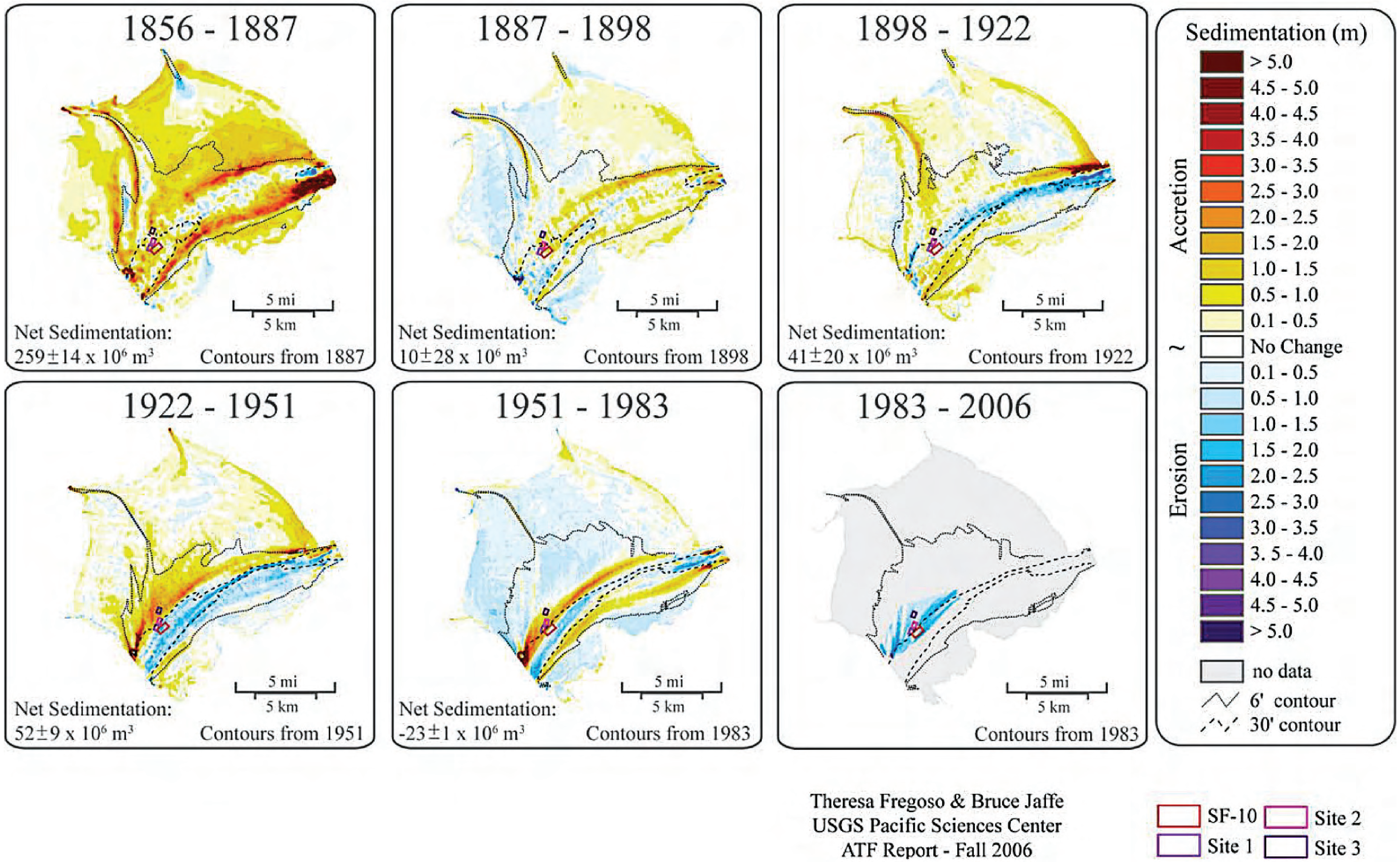
Figure 3.3-3
Bathymetry Historical Patterns
San Pablo Bay



Source: Jaffe and Fregoso 2007.

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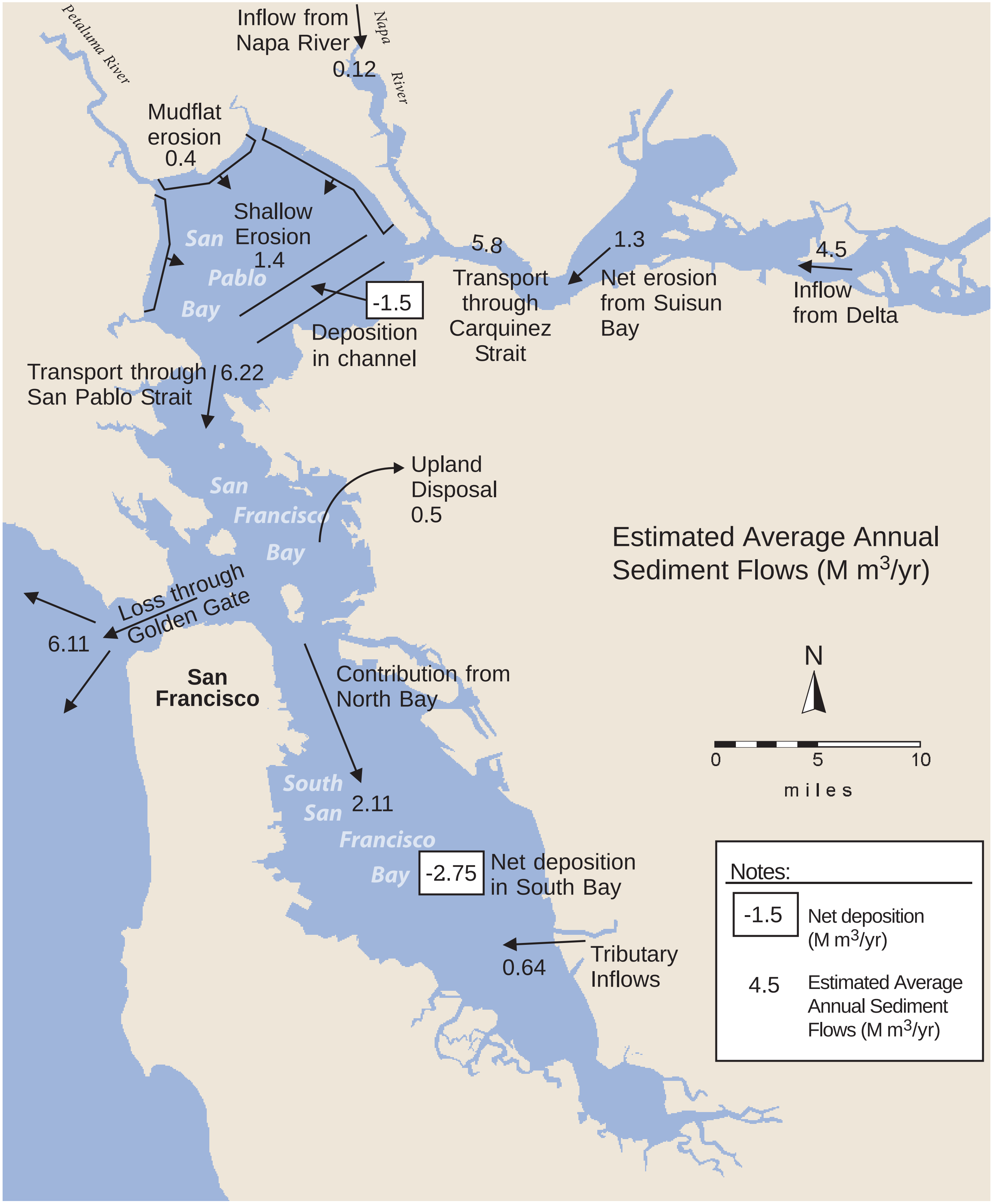
Figure 3.3-4
Historical Sediment Deposition and Erosion Patterns
San Pablo Bay



Source: PWA, 2002

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Figure 3.3-5
San Francisco Bay Sediment Budget

Table 3.3-1. San Francisco Bay Sediment Budget

	MMT/yr		
Period	**Inflow**	**Outflow**	**Decrease in Storage**
1955 to 1990	4.8	6.2	1.4
1995 to 2002	5.7	7.5	1.8

Source: Schoellhamer et al. 2005

Existing Sediment Budget of San Pablo Bay

Within San Pablo Bay, localized deposition of coarse-grained sediment occurs on the bottom and sides of the Pinole Shoal Channel, while finer-grained sediments are eroded from shallower areas and resuspended or deposited in side channels (such as Petaluma across the Flats) and onto the San Pablo Bay flats. The Petaluma across the Flats Channel functions as a localized area of accretion through capture of resuspended fine-grained sediments via the clockwise circulation pattern within the Bay and capture of coarse-grained sediment from Delta inflow. A conceptual model of sediment dynamics in San Pablo Bay is illustrated in Figure 3.3-6. Existing sediment erosion and accretion patterns in San Pablo Bay are shown in Figure 3.3-7.

There are several sources of sediment supplied into to San Pablo Bay, which are summarized below in Table 3.3-2. The largest source is sediment supplied from Carquinez Strait. Other sources, in order of decreasing size, are: sediment supply from local tributary streams, net erosion of the bottom of San Pablo Bay, and net import of dredged material. Deposition on tidal marsh adjacent to San Pablo Bay is believed to be a relatively small sediment sink (0.08 MMT/yr [0.08 mt/yr]). San Pablo Bay has complex interactions with its tributary streams, which also generally act as sediment traps. Assuming that the volumes entering and leaving San Pablo Bay are roughly in balance, average annual sediment flux from San Pablo Bay seaward into the Central Bay would be approximately 1.3 MMT/yr (1.4 mt/yr) (Schoellhamer et al. 2007, see Appendix A).

Overall, San Pablo Bay is believed to be an erosional environment, with net annual sediment outputs to the Central Bay (PWA 2002; Jaffe et al. 1998; Schoellhamer at al. 2007).

Table 3.3-2. San Pablo Bay Sediment Budget

Source:	**Mass per Year (MMT/yr)**
Inflows	
Carquinez Strait	0.76
Tributary streams	0.28
Bottom erosion	0.16
Net imported dredged material	0.04
Subtotal, inflows	*1.24*
Outflows	
Tidal marsh	-0.08

Source:	**Mass per Year (MMT/yr)**
Central Bay	-1.2
Subtotal, outflows	*-1.28*
Decrease in Storage	**-0.04**
Source: Schoellhamer et al. 2007 (see Appendix A)	

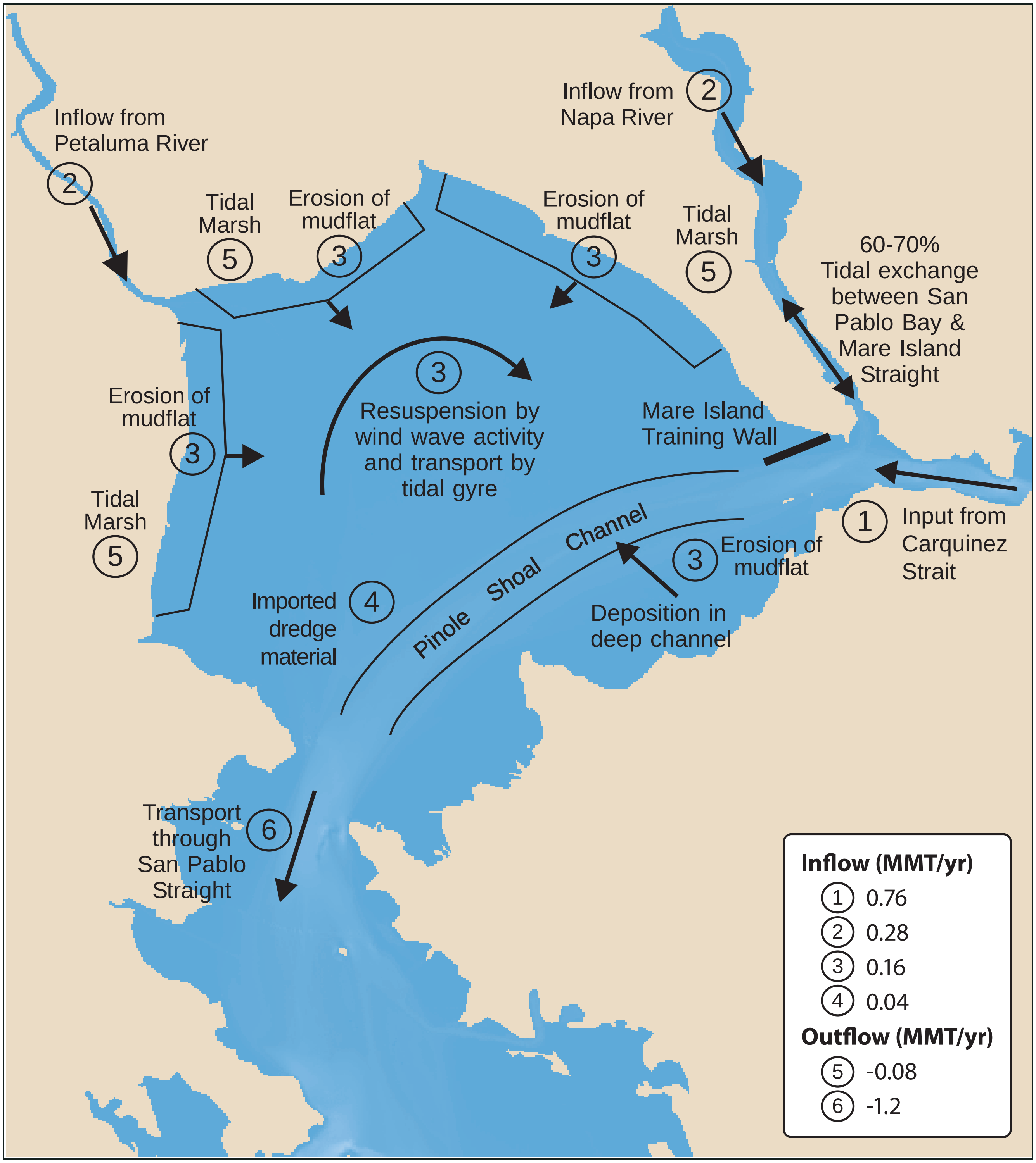
Dredged Material Placement

Materials dredged from various locations within San Francisco Bay are currently managed under the LTMS (see discussion in Appendix C, *Regulatory Setting*). Dredged materials are disposed of in San Francisco Bay, in the ocean, or beneficially used for wetland creation, levee maintenance, or construction fill. The long-term goal of the LTMS is to reduce in-Bay disposal of dredged material to 1.25 mcy (0.95 Mm^3). This target volume for in-Bay disposal has been reduced over time from a historic high of 6.6 mcy (about 5 Mm^3). There are four in-Bay disposal sites and two ocean sites: Bar Channel (SF-8), Carquinez Straits (SF-9, San Pablo Bay (SF-10), Alcatraz (SF-11), Suisun Bay (SF-16), and DODS. SF-9 and SF-10 are both located within San Pablo Bay. Table 3.1-1 in Section 3.1, *Existing Dredge Material Placement*, shows the disposal volumes for each of these sites from 2000 to 2007, and Table 3.1-2 discusses the permitted volumes for each site. The proposed ATF would be located near the SF-10 dredged material placement site.

Dredged materials are allowed to naturally disperse after disposal at all these sites. Once released from the barge, dredged sediments distribute within the water column and on the floor of the bay as a function of their size, shape, moisture content, and chemical structure; as well as of the characteristics of the disposal site and tide, salinity, and wind-driven currents. Disposal is limited over time such that the dispersal capacity of a given site is not exceeded in-Bay, and, on this basis, the LTMS program does not allow materials to accumulate at the sites. All in-Bay disposal sites are dispersive; SF-9 and SF-10 are fully dispersive.

Mudflat Dynamics

The volume of sediment entering San Pablo Bay has varied greatly over time, with the largest volumes occurring during the hydraulic mining era. While no statistical relationship has been established, net sediment loads and tidal mudflat area appear to be related, (see Figure 3.3-8.). Tidal mudflats grew in response to the great influx of hydraulic mining debris. The 1887 survey of San Pablo Bay showed the largest amount of mudflats (about 16,000 ac [6,474 ha]). Mudflats eroded rapidly as the amount of mining debris washed into the Bay decreased, and the area was relatively stable during the first half of the 20th century. Mudflats then eroded at a rate of about 90 ac/yr (36 ha/yr) from 1951 to 1983 (Jaffe et al. 1998). While the period between 1983 and the present has not been quantified, recent reports indicate that mudflat loss continues in San Pablo Bay (Grismer et al. 2004).



Source: Modified after PWA, 2002.

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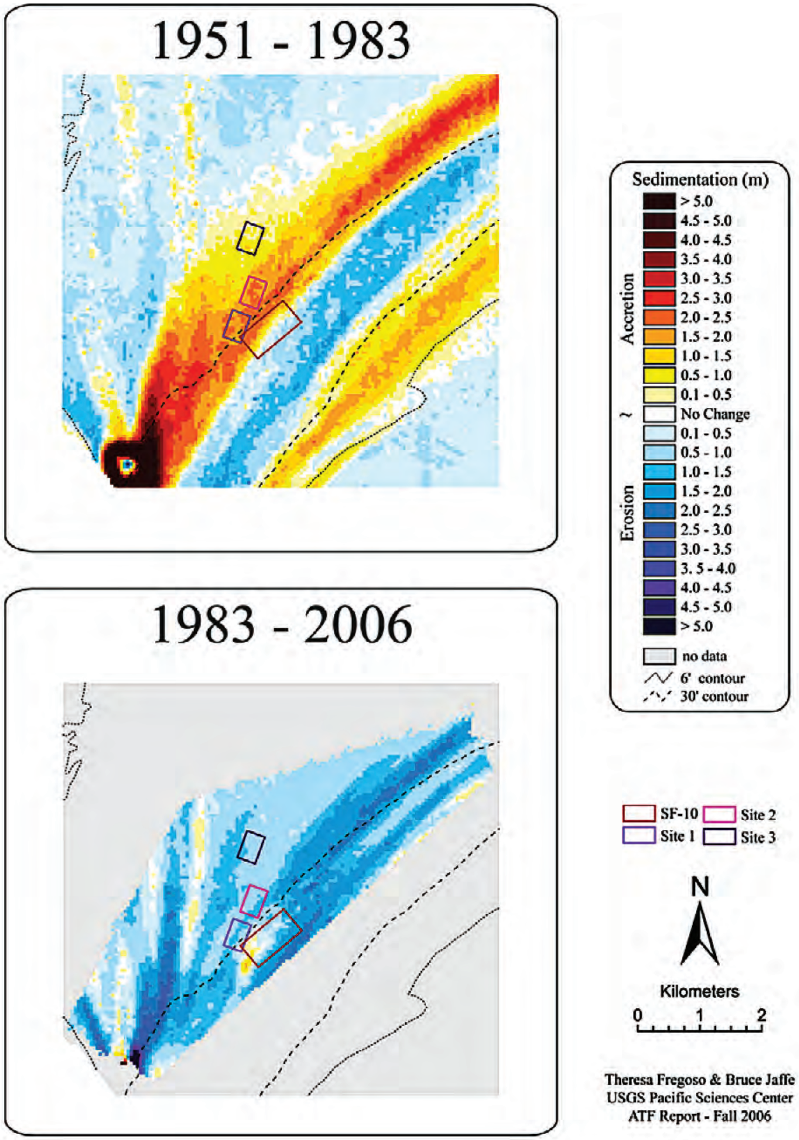
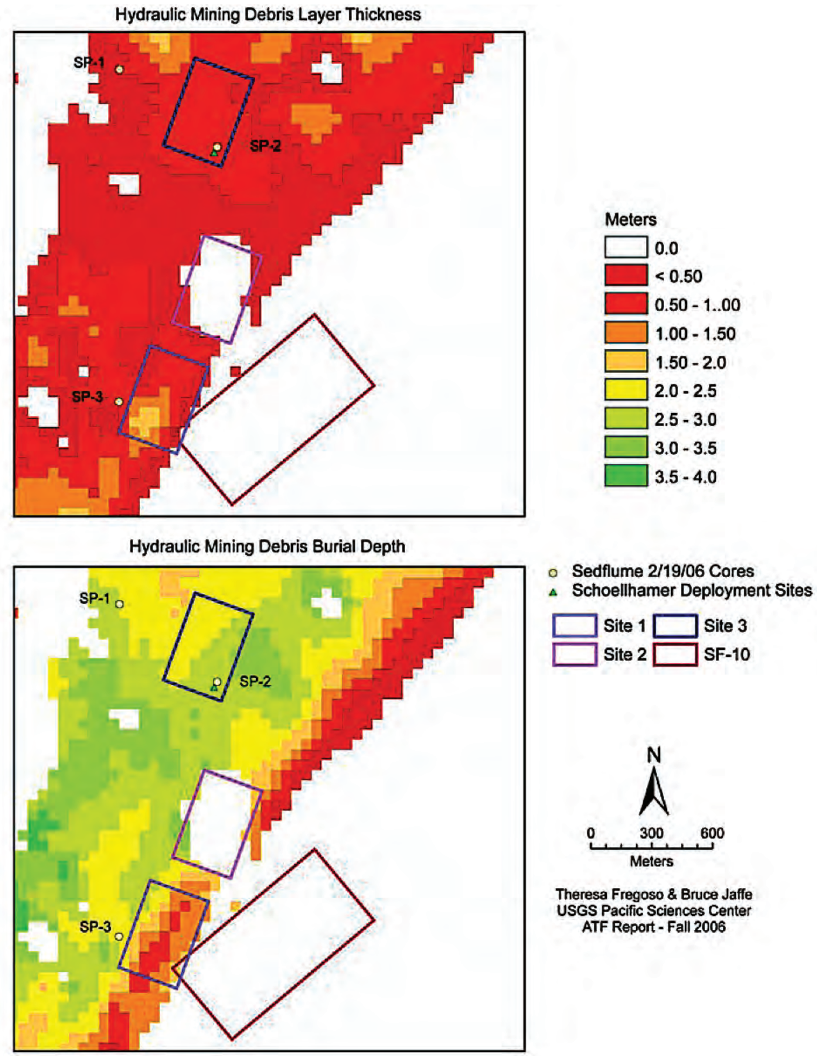
Figure 3.3-6
San Pablo Bay Sediment Dynamics



Net deposition and erosion in the ATF region.

Source: Jaffe and Fregoso 2007.



Thickness and burial depth of the mercury-contaminated hydraulic mining debris layer.

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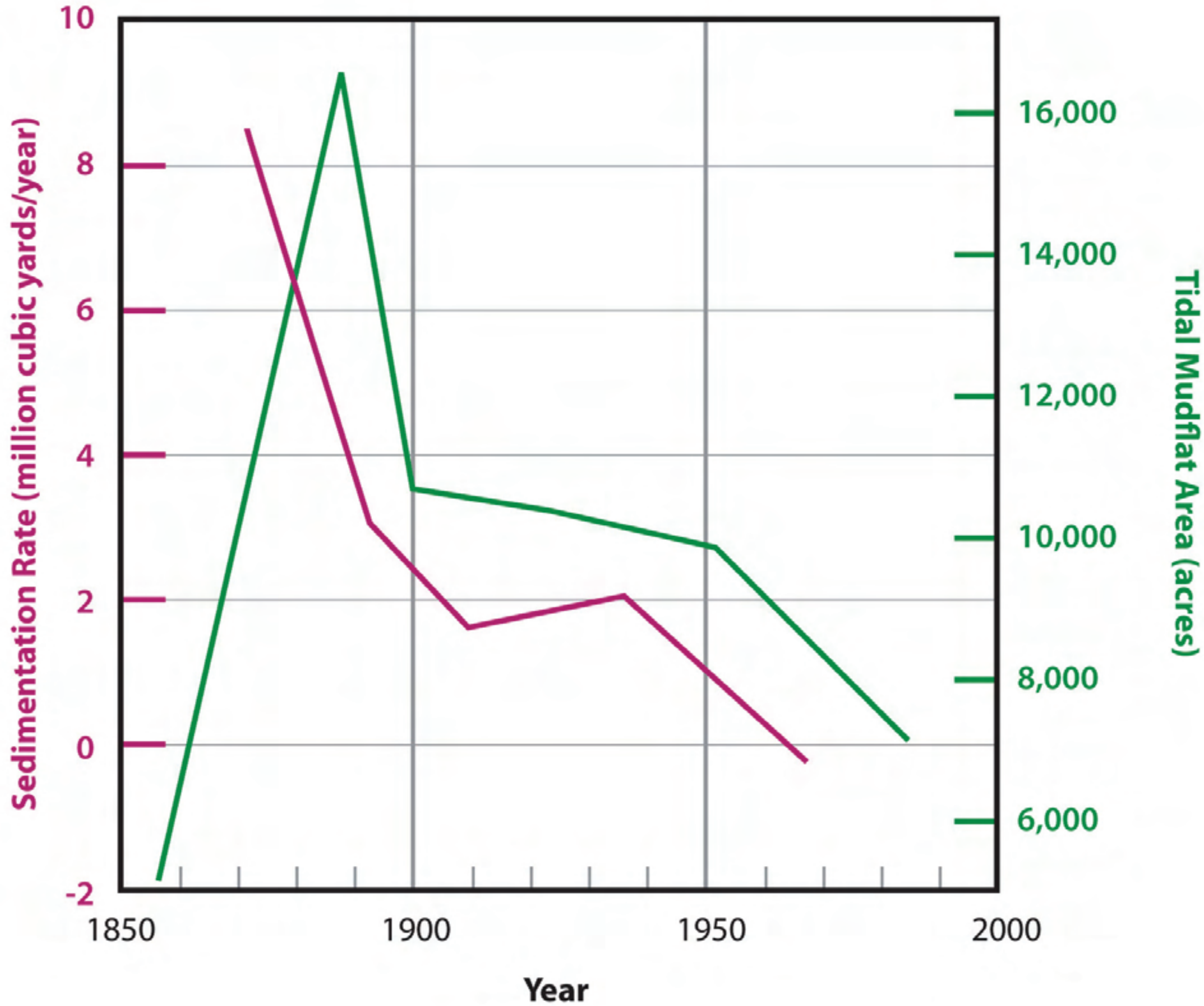
Figure 3.3-7
Recent Sediment Deposition and Erosion Patterns
San Pablo Bay



Source: Jaffe et al. 1998

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Figure 3.3-8
Historical Sediment Loads of San Pablo Bay

Section 3.4
Water and Sediment Quality

The affected environment for water and sediment quality encompasses three scales under the proposed action and alternatives: San Francisco Bay, San Pablo Bay, and the proposed ATF site. The discussion of existing water quality conditions is followed by a discussion of existing sediment quality conditions, at each of these scales.

Existing conditions with respect to water and sediment quality were compiled by reviewing relevant technical reports and data primarily collected by the *Regional Monitoring Program for Water Quality in the San Francisco Bay Estuary* (RMP). Additionally, reports prepared by federal and state agencies, studies conducted in the project area, and an evaluation of monitoring data were reviewed and are summarized below. Existing suspended sediment and turbidity in the project area is discussed in Section 3.3, *Circulation and Sedimentation*.

3.4.1 Existing Water Quality Conditions

Water quality in San Francisco Bay is influenced by inflows from the Sacramento-San Joaquin Delta, various tributaries including Napa River, Sonoma Creek, Petaluma River, and Novato Creek, and tidal flows from the Pacific Ocean. Natural as well as human influences in and around San Francisco Bay also contribute to present water quality conditions. As discussed in Section 3.3, *Circulation and Sedimentation*, and shown in Figure 3.3-1, San Francisco Bay is generally broken into four regions: the Sacramento-San Joaquin Delta; San Pablo Bay; Central Bay; and South Bay.

3.4.1.1 Regional Water Quality Parameters

Temperature affects aquatic organisms and their biological processes. Extreme water temperatures can have deleterious effects on organisms' life history and reproduction, especially for sensitive species such as salmonids (see Section 3.5, *Marine and Terrestrial Biology*, for further information). Average temperatures in San Francisco Bay are between 50 to 68°Fahrenheit (F) (10 and 20°Centigrade [C]).

Salinity is typically measured by the amount of anions, or salts dissolved in water. This is measured by determining total dissolved solids and electrical conductivity. San Francisco Bay is influenced by freshwater inflows from the Sacramento River, the San Joaquin River, and local tributaries. Saline waters from the Pacific Ocean mix with fresh water to produce the existing salinity conditions in San Francisco Bay. Salinity varies within the estuary. In the South Bay, salinity approaches ocean concentrations (32 parts per thousand [ppt]) during much of the year and high evaporation rates in the summer season cause salinity to exceed ocean water concentrations. Salinity of San Pablo Bay increases along a gradient from the Sacramento-San Joaquin River Delta to the Central Bay. Average salinity in Suisun Bay is approximately 7 ppt; increasing to 30 ppt in the Central Bay (USACE et al 1998). Daily variation in salinities measured in monitoring during 2005/2006 at the proposed ATF site ranged from about 22 to 30 ppt in November/December, falling to 0 to 10 ppt in late December/January during heavy Delta inflow to San Pablo Bay, ranging between 5 and 25 ppt between January and March depending on inflows, falling to between 0 and 20 ppt in April 2005 with heavy Delta inflows, and rising to 15 to 25 ppt in May/June/July (Schoellhamer et al. 2007, see Appendix A, Chapter 2).

Dissolved oxygen (DO) is an important water quality parameter for aquatic invertebrates and fish, which depend on oxygen to survive. In estuarine waters, DO levels are increased by aeration factors (inflow, wind, waves), concentrations in freshwater inflow, salinity, temperature, and photosynthesis of phytoplankton and other aquatic plants. DO concentrations are lowered by plant and animal respiration, chemical oxidation, and bacterial decomposition of organic matter. In San Francisco Bay, waters are generally well oxygenated, except in the lower South Bay where tidal mixing is muted and high water temperatures reduce DO concentrations. Typical concentrations range from 9 to 10 milligrams per liter (mg/l) throughout the entire San Francisco Bay during the winter months and 6 to 9 mg/l during the later summer months (USACE et al. 1998).

pH is a measure of the relative balance between positively-charged hydrogen ions and negatively-charged hydroxide ions, and is a gauge of the acidity of water. pH is measured on a unitless log scale between 0 and 14, with neutral (balanced) conditions being 7. The pH of San Francisco Bay is fairly consistent throughout, ranging from 7.8 to 8.2.

Nutrient concentrations change seasonally, as aquatic plants respond to the extent of sunlight and either sequester or release nutrients as they grow or decompose. Agricultural fertilizers, animal waste (e.g., manure), and human waste (e.g., leaky septic systems) can lead to elevated nutrients above background levels, and stimulate plant growth. Precipitation, stream flow, air temperature, and water temperature all influence nutrient concentrations in San Francisco Bay.

Metals are naturally occurring elements but are considered environmental constituents of concern when their concentrations exceed normal or average background levels. Metals are released into the water, air, and terrestrial environments as wastes from mining, industrial manufacturing and discharges, combustion, erosion of natural deposits, and agricultural applications (i.e., pesticides and fertilizers). Trace metals are monitored throughout San Francisco Bay on a regular basis by the RMP. The RMP publishes monitoring results in an annual report. Total and dissolved concentrations of trace metals in San Pablo Bay from the RMP's 2005 annual monitoring report are shown in Table 3.4-1. The monitoring data show no elevated levels of trace metals in San Pablo Bay. However, other areas of San Francisco Bay, particularly South Bay, exhibit trace metal concentrations that exceed water quality objectives.

Excessive amounts of mercury found in San Francisco Bay fish and other aquatic organisms make Bay fish unhealthy for consumption by both humans and wildlife (SFEI 2006). Mercury was, and continues to be, introduced to San Francisco Bay from a variety of sources. However, the primary source of mercury in San Pablo Bay is from the hydraulic gold mining era; mercury used for mining gold was transported to San Pablo Bay from mining areas by tributaries. Elemental mercury was used to recover gold and silver from placer gravels in the Coast Range and Sierra Nevada Mountains. As a

Table 3.4-1. Ranges of Concentrations of Trace Metals in Water Samples from San Pablo Bay in 2004/5 (µg/L[1])

		Arsenic (As)	Cadmium (Cd)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Nickel (Ni)	Selenium (Se)	Silver (Ag)	Zinc (Zn)
Estuarine Water Quality Objectives[1]		36	9.3	3.1	8.1	2.1 (total)	8.2	71 (total)	1.9	81
Total	2004 to 2005	2.4–3.4	0.06–0.1	2.2–3.7	0.2–1.4	0.004–0.025	2.0–5.0	0.12–0.14	0.01–0.03	2.0–7.0
Dissolved	2004 to 2005	2.1–2.5	0.07–0.09	1.8–2.8	0.01–0.02	0.001–0.002	1.4–2.0	0.12–0.14	0.004–0.012	0.55–0.95

[1] This denotes the unit of measure micrograms per liter

[2] The most stringent objective shown in Table C-6 (Appendix C of this draft SEIS/EIR) applies for dissolved trace metals in estuarine environments. The water quality objectives for mercury and selenium are total fractions, as opposed to dissolved fractions. Source for water quality objectives is RWQCB Basin Plan (RWQCB 2006a).

Sources: SFEI 2006; RWQCB 2006a.

result, sediments deposited in San Pablo Bay between 1856 and 1887 contain elevated levels of mercury (Bouse et al. 1996; Hornberger et al., 1999; Marvin-Di-Pasquale et al.2003). The sediment layer deposited in this period, referred to as the hydraulic mining debris (HMD) layer, varies in thickness and depth throughout San Pablo Bay and is influenced by deposition and erosion patterns over time (Jaffe and Fregoso 2007). The HMD layer is discussed further in the sediment quality section below.

Although mercury is often sequestered or immobilized by adsorption to soil particles, it can be biologically transformed into toxic methylmercury. Methylmercury is more water soluble, volatile, and bioavailable than inorganic mercury; it is bioaccumulated and bioconcentrated by aquatic organisms and biomagnified in the food chain (Agency for Toxic Substances and Disease Registry 1999). Median concentrations of mercury in commonly consumed San Francisco Bay fish range from 0.08 to 0.35 ppm; the proposed standard for fish consumed by humans is 0.2 ppm (SFEI 2006b).

Disturbance of sediments containing biologically unavailable mercury has the potential to release mercury to the water column. In addition, oxidizing conditions can cause inorganic mercury sequestered in sediments to be released into overlying waters. Once released, these mercury cations become available for methylation by sulfate-reducing bacteria (Compeau and Bartha 1985). The resultant concentration of methylmercury depends on numerous variables: salinity, pH, vegetation, sulfur concentration, dissolved organic carbon, oxidation/reduction potential, sulfide-reducing bacteria, and seasonal variations in each of the identified variables. The quantity of inorganic mercury present in sediments does not imply high rates of methylmercury formation (Marvin-DiPasquale et al. 2003).

Trace organic constituents of concern are regularly measured in waters of San Francisco Bay by the RMP. Constituents of particular concern are polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and organochlorine pesticides. According to the monitoring results, concentrations of PAHs are highest in the lower South Bay and Suisun Bay, but are elevated throughout the estuary. Concentrations of PCBs are highest in the South Bay and gradually decrease in the northern portions of the estuary. Pesticides are generally higher in the South and Suisun Bays compared to other parts of the estuary (SFEI 2006). Concentrations of organic constituents of concern measured in San Pablo Bay in 2004/2005 are listed in Table 3.4-2 below.

Table 3.4-2. Organic Contaminant Concentrations in San Pablo Bay (µg/l)

	2004 to 2005
PAHs	12.0–20.0
PCBs	0.07–0.08
Pesticides	N/A
Source: SFEI, 2006	

Sediment when suspended in the water column (suspended sediment) can limit light availability and photosynthesis of algae or aquatic plants. A large influx of sediment from tributaries or other sediment sources to San Francisco Bay or San Pablo Bay may lead to high levels of suspended sediment followed by the sediment settling out onto the floor of the bay. This is a natural process, however, it may be considered a water quality pollutant when they exceed natural (i.e., not human influenced) levels.

3.4.1.2 Regional Groundwater Quality

The shallow groundwater at the BMKV site, where the BMKV basin would be located under Alternative 4, has high salinity because of the historic influence of San Pablo Bay. Groundwater is of poor quality and is not used as a potable water source. A deep, higher-quality aquifer is present at an unknown depth. Because of the prevalence of bay muds, surface runoff is unlikely to recharge the deeper groundwater under the site. The general direction of groundwater flow is to the east (Woodward-Clyde 1985); however, the low transmissivity of bay muds greatly reduces the movement of shallow groundwater into San Pablo Bay. Groundwater also discharges to the interior drainage channels and is pumped to San Pablo Bay.

3.4.2 Sediment Quality Conditions

Literally tons of constituents of concern are deposited in San Francisco Bay annually from a variety of sources, including numerous industrial, agricultural, natural, and domestic activities. These constituents of concern include trace elements such as copper, nickel, silver, zinc, and synthetic organic compounds (e.g., organochlorine pesticides, PCBs, and PAHs). Many persistent constituents of concern become bound to particulate matter and accumulate in areas of sediment deposition. Once these constituents of concern enter the estuary, their fate is determined by a combination of physical, chemical, and biological processes.

Disturbance to bottom sediments may redistribute constituents of concern that are buried or otherwise sequestered in the sediments. These constituents of concern, once disturbed, may become biologically available in sediments and water at the site and may adversely affect organisms through ingestion or exposure to concentrations in solution. The behavior of constituents of concern associated with sediments is complex and is influenced by temperature, amount of oxygen available, degree of acidity, sediment organic-carbon content, salinity, and biological activity. The specific characteristics of each environment in which sediments are deposited will determine the mobility and toxicity of the constituents of concern and, in turn, the way in which those constituents of concern can affect organisms.

3.4.2.1 Regional Sediment Quality Conditions

Metals in Sediments

Hornberger et al. (1999) examined sedimentary deposits throughout San Francisco Bay to compare concentrations of metals to other coastal sedimentary deposits. The study identified the baseline concentrations of chromium, copper, mercury, nickel, lead, silver, and zinc (see Table 3.4-3). To evaluate whether a site expresses ambient or contaminated conditions, Gandesbery et al. (1999) developed Ambient Sediment Concentration (ASC) values from the cleanest areas of the estuary and known contaminated sites. ASC values are established for sandy (>40% sand) and muddy (>40% fines) sediments are summarized in Table 3.4-3.

Table 3.4-3. Guidelines to Evaluate Chemical Concentrations in Sediment (milligrams/kilogram [mg/kg] dry weight)

	Total Background Concentrations (Estuary-wide ranges, near total)	Ambient Sediment Concentrations - Sandy (<40% fines)	Ambient Sediment Concentrations—Muddy (>40% fines)
Arsenic	—	13.5	15.3
Cadmium	—	0.25	0.33
Chromium	110–170	91.4	112.0
Copper	20–55	31.7	67.1
Lead	20–40	20.3	43.2
Mercury	0.05–0.07[1]	0.25	0.43
Nickel	70–100	92.9	112.0
Selenium	—	0.59	0.64
Silver	0.7–0.11	0.31	0.58
Zinc	60–70	97.8	158.0

[1] Near total concentration, approximates bioavailability

Source: SFEI 2006

A summary of metals concentrations sampled during 2004/5 from San Pablo Bay by the RMP are illustrated in Table 3.4-4. The data reflect ambient sediment concentrations for the estuary. However, concentrations of arsenic, copper, mercury, and nickel are above the Effects Range-Low (ER-L)[1] levels that are associated with observed biological effects in laboratory, field, or modeling studies.

Metals can exist in various phases in an aquatic environment and react differently to environmental factors. The most influential factor governing bioavailability of metals is hydrogen ion activity (pH) (John and Leventhal 1996). Increases of 50 degrees Fahrenheit (10°C) in water temperature can double the biological process rate in organisms, which can increase update or release of metals (Luoma 1983). Anoxic environments formed in organic carbon-rich sediments can promote mineral deposition and metals, such as arsenic, cadmium, copper, mercury, lead, and zinc, to become insoluble and unavailable to biota (Morse 1994).

Uptake of bioavailable metals occurs through two pathways: ingestion of metal-enriched sediment and suspended particles and uptake from solution. Studies of bioavailability indicate that aquatic organisms and terrestrial animals uptake metals from solutions more efficiently than via particulate

[1] Effects Range-Low (ER-L) represents a concentration at which adverse benthic impacts are found in approximately 10% of studies.

matter ingestion (Luoma 1983). However, geochemical, biological, and environmental factors that control bioaccumulation of metals are not fully understood (John and Leventhal 1996).

Table 3.4-4. Ranges of Concentrations of Trace Metals in Sediment from San Pablo Bay in 2004/5 (mg/kg)

	Arsenic (As)	**Cadmium (Cd)**	**Copper (Cu)**	**Lead (Pb)**	**Mercury (Hg)**	**Nickel (Ni)**	**Selenium (Se)**	**Silver (Ag)**	**Zinc (Zn)**
Ambient Sediment Concentration (ASC)—muddy (>40% fines)	15.3	0.33	67.1	43.2	0.43	112.0	0.64	0.58	158.0
Effect Range-Low (ERL)	8.2	1.2	34	46.7	0.15	20.9	NA	1	150
2004–2005	7.0–11.0	0.2–0.3	49.0–59.0	18.0–22.0	0.2–0.3	79.0–105.0	0.1–0.3	0.08–0.15	110.0–145.0

Sources: USACE et al., 1998, SFEI, 2006.

Mercury

In San Francisco Bay, mercury concentrations are present in sediments at levels five times greater than the mean concentrations found in other U.S. coastal sediments (Daskalakis and O’Connor 1995).

This condition is due to legacy mercury mines and mine tailings from past hydraulic gold mining activities in the Sierra Nevada. In San Pablo Bay, sediment deposited between 1856 and 1887 contains hydraulic mining debris, also referred to as the HMD layer. This layer contains elevated levels of mercury between 0.3 and 0.6 mg/kg dry weight in San Pablo Bay (Hornberger et al. 1999; Bouse et al. 1996; Marvin-Di Pasquale et al. 2003; and Jaffe and Fregoso 2007). In 2004/2005 surface sediment sampling, concentrations in San Pablo Bay sediment range between 0.1 and 0.3 mg/kg, and methylmercury concentrations range from 0 to 0.4 g/kg (SFEI 2006a).

Methylmercury in San Francisco Bay sediment is influenced in part by contaminant sources and sediment dynamics. As discussed in Marvin-DiPasquale et al. (2003), methylmercury is produced *in situ* by sulfate-reducing bacteria in the presence of organic material and mercury. Several studies have measured concentrations of methylmercury in San Pablo Bay, showing an increase during the summer months versus the winter months. These studies suggest that the likely cause of seasonal methylmercury variation is a result of increased microbial activity and methylation in warmer temperatures, fresh supplies of organic matter from riverine inputs or spring phytoplankton blooms, and/or increased oxygen that solubilizes mercury sulfides and makes mercury available for methylation (Baeyens et. al., 1998; Gill et. al., 1999; Bloom et. al., 1999).

Sampling of methylmercury in sediments within San Pablo Bay at several surface water sites and marsh sites revealed that methylmercury in open water (0.45 to 0.75 parts per billion [ppb]) is lower compared to concentrations in marsh sites that were sampled (1.9 to 8.9 ppb). Decreases in mercury concentrations, particularly those in the marsh sampling sites, have been observed in correspondence to sediment depth (Marvin-DiPasquale et. al. 2003).

Organic Constituents of Concern in Sediments

As part of the RMP, various organic constituents of concern are measured and monitored in sediments. The three major classes of organic constituents of concern in sediment are similar to those of concern for water quality: PAHs PCBs, and pesticides. Ambient concentrations of PCBs and pesticides are typically higher in the South Bay compared to San Pablo Bay and are found at higher concentrations (up to two orders of magnitude higher) at depths of 2 to 3 feet (0.6 to 0.9 m below the bottom surface (Leatherbarrow et. al. 2005).

Contaminant concentrations in sediment for PCBs range between 2 and 5 µg/kg in San Pablo Bay. Concentrations of DDTs in sediment range between 1.5 and 2 µg/kg in San Pablo Bay. Concentrations of chlordanes and dieldrin pesticides in San Pablo Bay have been measured between 0.07 and 0.15 and 0.04 and 0.07 µg/kg, respectively (SFEI 2006).

Suspended Sediment

Suspended sediment transport within San Pablo Bay follows a seasonal cycle: the majority of suspended sediment is delivered through the Delta during the large, winter freshwater flows, creating a large pool of erodible sediment within the channels and shallows. During the following summer months, persistent onshore winds generate wind waves, resuspending bed sediments in the shallows for transport by tidal currents. Sediment is transported away from high energy areas (mudflats and shallow off-channel areas, for example) to lower energy areas (continental shelf, marinas, deep channels, and marsh surfaces, for example). As the summer progresses, the finer fraction of this erodible pool is reduced. In the fall, when neither wind nor freshwater flow is significant, suspended sediment concentrations are at their lowest. As the wet season commences during winter, the cycle repeats itself.

Suspended sediment concentrations tend to be highest in the shallow portions of San Pablo Bay, where wind-waves can resuspend bottom sediments. Throughout the entire Bay, USGS data show average suspended sediment concentrations of approximately 80–150 mg/l for water years 1997 and 1998 (Jones and Stokes 2003), with concentrations as high as 1,200 mg/l in shallow portions of San Pablo Bay (Buchanan and Ganju 2002). Table 3.4-5 shows measured suspended sediment concentrations near the proposed ATF site between November 2005 and September 2006.

Also, it is important to note that existing disposal of sediment at SF-9 and SF-10 generate temporary increases in suspended sediment. To date, measurements have not been taken to determine the duration, intensity, or extent of the sediment suspension induced by existing dredged material placement in San Pablo Bay.

Table 3.4-5. Suspended Sediment Concentrations near the ATF Site, November 2005–September 2006

	Suspended Sediment Concentration (mg/l)		
Month	**Lower quartile**	**Median**	**Upper quartile**
November 2005	28	41	73
December 2005	31	50	100
January 2006	50	112	211
February 2006	34	55	107
March 2006	39	81	143
April 2006	43	75	130
May 2006	33	54	104
June 2006	27	45	95
July 2006	29	49	103
August 2006	No data	No data	No data
September 2006	11	14	23

Source: Schoellhamer et al. 2007 (see Appendix A)

3.4.3 Site-Specific Sediment Quality

3.4.3.1 Aquatic Site Sediment Quality

Sediment around the project area is analyzed annually as part of the RMP and LTMS. Contaminant concentrations observed in the relevant portions of San Pablo Bay project area are generally within the ranges of sediments of other parts of San Francisco Bay (USACE et al. 1998).

Jaffe and Fregoso (2007) conducted a survey of San Pablo Bay to determine the location and thickness of the HMD layer in the vicinity of the proposed in-Bay ATF site. The thickness and location of the HMD layer varies due to past erosional and depositional periods and patterns of sediment transport in San Pablo Bay. Their results, presented in Appendix A, show that 15–100% of the area of the basin could be underlain with HMD, depending on the location ultimately chosen. Further, the HMD is predicted to be buried under 6.5–8.2 feet (1.9 – 2.5 m) of sediment with concentrations of mercury ranging from 0.3–0.6 μg/g, depending on the exact location chosen (Jaffe and Fregoso 2007). It is anticipated that sediments beneath and above the HMD layer could have mercury concentrations similar to background levels (Jaffe and Fregoso 2007).

3.4.3.2 Inland Site Sediment Quality

Sediment quality at the BMKV site is addressed due to the proposed construction of the BMKV basin under Alternative 4. Blymyer Engineers Inc. completed a previous environmental site assessment in 1989. The assessment performed shallow-soil sampling tests along the HAAF property boundary and on the BMKV site itself to test for petroleum hydrocarbons and herbicides/pesticides. No detections of herbicide/pesticide compounds or petroleum hydrocarbons were found in the samples collected (Miller Pacific Engineering Group 1994).

A Phase I Environmental Site Assessment and a Shallow Soil Investigation were completed in 1994 and 2002, respectively, for the proposed BMKV expansion site. The Phase I assessment identified several items that warranted further attention (Miller Pacific Engineering Group 1994). The Shallow Soil Investigation revealed several source areas on the BMKV site that exhibited low-level contamination due to the presence of various hazardous substances and/or waste (Erler and Kalinowski 2002). The range of contamination for each type of hazardous substance identified in the Shallow Soil Investigation was generally below concentrations as established by the EPA Region IX Preliminary Remediation Goals (PRGs) for residential soil. The BMKV basin would not be located in any of the potential areas of concern identified in the Phase I and the Shallow Soil studies.

While the site has not been well characterized with respect to potential for mercury-contaminated sediments and elevated methylmercury concentrations, adjacent sites have been analyzed in San Pablo Bay, Novato Creek, and the Bel Marin Keys north lagoon. The concentrations at these sites are generally consistent with mercury concentrations in other sediments throughout San Francisco Bay. It is conceivable that the BMKV site could have elevated mercury levels in sediment; however, USACE and Conservancy are not making any determinations at this time regarding the suitability of material dredged to create the basin under Alternative 4, for beneficial use at the HWRP site. That determination would be made by the DMMO.

Section 3.5
Marine and Terrestrial Biology

3.5.1 Existing Conditions

The existing conditions for discussion of the affected environment as it relates to marine and terrestrial biology was determined from a review of pertinent background documents and data relating to the species and habitats that occur within the project area, and the adjacent species and habitats that could be indirectly affected resulting from the construction, operation, and decommissioning of the proposed action and alternatives.

3.5.1.1 Regional Conditions

The San Pablo Bay ecosystem includes both marine and terrestrial habitats. San Pablo Bay is composed of several types of habitats that are important to estuary plant and wildlife species, including open water (deep and shallow bay), intertidal mudflats, and tidal wetlands.

Under Alternatives 1, 2, and 3, the discussion of is focused on the marine and salt marsh species (including aquatic benthos, fish, marine mammals, birds, small terrestrial mammals, and plants) that occupy and utilize the aquatic portions of the study ecosystem. Under Alternative 4 there is a discussion of similar marine species and habitats, but also a discussion of terrestrial habitats within the BMKV basin area. This section focuses only on the limited area that will be excavated for the BMKV basin.

Biological Communities

Habitats present within the footprint of Alternatives 1–3 include: open water in San Pablo Bay; open water and mudflat along the dredged material delivery pipeline corridor; and mudflat and tidal marsh near the pipeline terminus. Habitats present within the footprint of Alternative 4 include: open water in San Pablo Bay; open water, mudflat, and tidal marsh along the direct channel alignment; and agricultural lands, seasonal wetland, and the outboard marsh at the BMKV basin site.

The following discussion of habitats in the project area is from the *Baylands Ecosystem Habitat Goals Report* (Goals Project 1998). Bay habitats are tied to the baylands and are components of the baylands ecosystem. They are important for aquatic organisms, fish, sea birds, and marine mammals that move back and forth between deep and shallow waters. Figure 3.5-1 illustrates different habitats and water depths in the Bay. A schematic of typical aquatic habitats by tide levels is provided in Figure 3.5-2.

San Pablo Bay

Bay habitats in the vicinity of the project are divided into four categories: areas of deep water (deep bay); areas of shallow water (shallow bay and channels); tidal flats (mudflats, sandflats, and shell flats); and tidal marsh (vegetated wetland that is subject to tidal action).

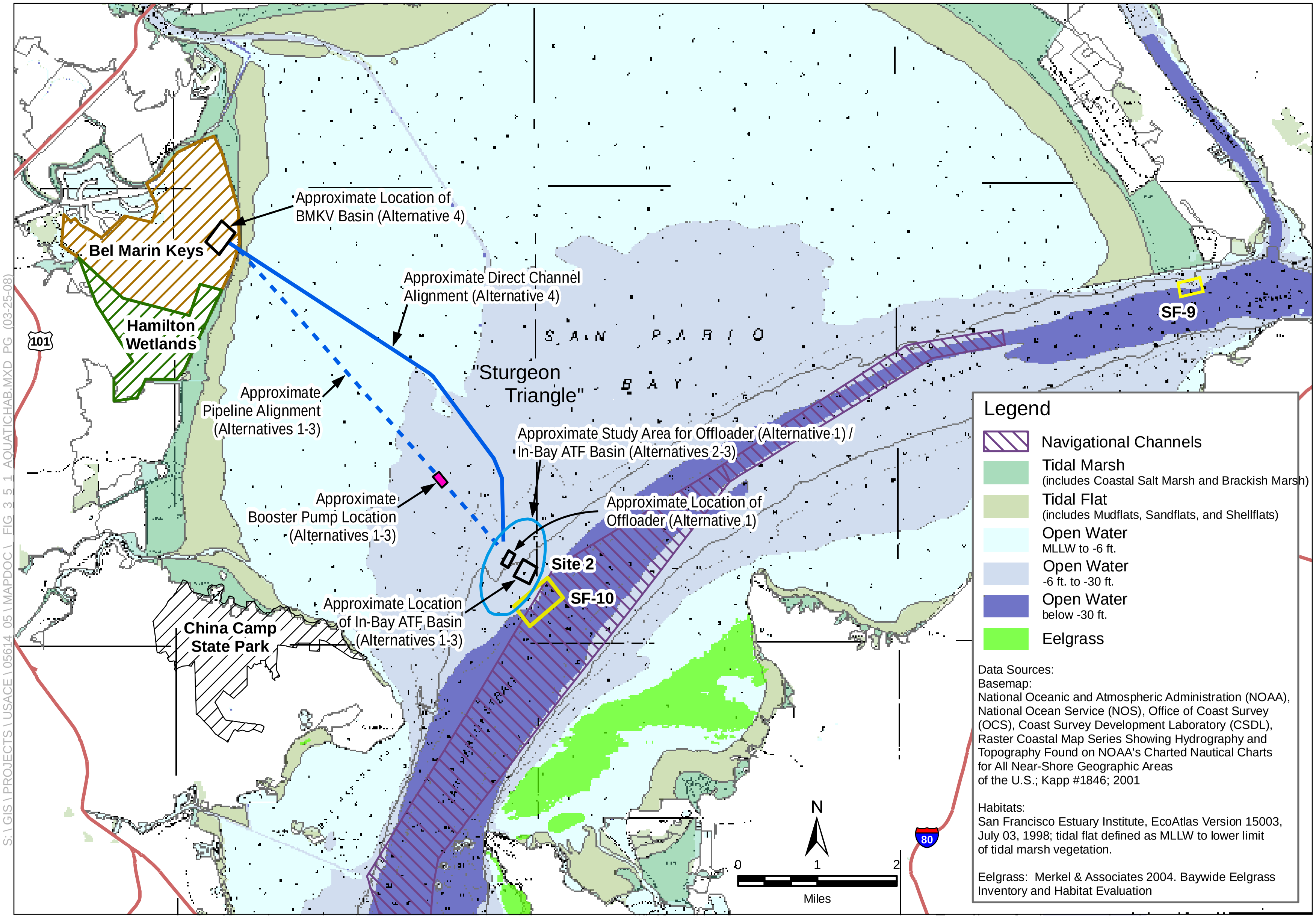
Deep Bay Open Water Habitat

Parts of the project area that are deeper than 18 feet (5.5 m) below MLLW are characterized as deep bays. The sediments of deep bay and channel habitat vary widely in character, from coarse sand to very fine clays and silts. In the parts of the Bay where currents are strong the bottom is mostly coarse sand; this condition is especially evident in the deeper reaches of San Pablo Bay. Deep bays and channels are important for aquatic invertebrates, including California bay shrimp, Dungeness crab, and rock crab, and for fish such as green sturgeon, white sturgeon, and brown rockfish. They also are migratory corridors for anadromous fish, including green sturgeon, Chinook salmon, steelhead and lamprey. Deep bays and channels are habitat for several species of water birds, including brown pelican, double-crested cormorant, greater and lesser scaup, surf scoter, and Caspian tern. Marine mammals such as harbor seal and California sea lion also utilize this habitat in this area. Gray whales are also infrequently sighted in the Bay and are occasionally observed in deeper water areas of San Pablo Bay (Water Transit Authority 2003).

The benthic (bottom dwelling) communities of San Pablo Bay are typified by low diversity and the dominance of a few species. The following species are commonly found in San Pablo Bay: the amphipods *Ampelisca abdita*, *Corophium* spp., and *Grandidierella japonica*; the polychaetes *Glycinde* sp., *Heteromastus filiformis*, and *Streblopsio benedicti*; and the mollusks *Gemma gemma* (amethyst gem clam), *Potamocorbula amurensis* (Asian clam), *Ilyanassa obsolete* (mud snails), *Musculus senhousia* (small mussel), and *Tapes japonica* (rock cockle).

The benthic and pelagic biota of San Francisco Bay have gone through significant changes over the past two centuries due to both anthropogenic activities (such as mining, water diversions, discharges of industrial and municipal effluent and stormwater, and introductions of nonnative species) and geographic and climate events (such as interdecadal oceanic regime changes). San Pablo Bay experienced a major benthic change with introduction of the Asian clam in 1986, which indirectly contributed to population collapses of consumers such as the mysid shrimp (*Neomysis mercedis*) and decline of the formerly dominant species of copepods (*Acartia clausi s.l.*) (Kimmerer et al. 1994; Kimmerer and Orsi 1996).

Most recently, Cloern et al. (2007) reported a large shift in biotic communities in the Bay, beginning in 1999. The abrupt El Niño-La Niña transition in the late 1990s initiated a multi-year period of upwelling and increased southerly flow of subarctic waters along the coast. Beginning at roughly the same time, researchers noted increasing phytoplankton biomass and algal blooms occurring during seasonal periods that were not common. Coincident with these events, researchers noted a sharp decline in bivalve mollusks (which feed on phytoplankton), and increased abundances of English sole, Dungeness crab, and bay shrimp, which are bivalve predators. The authors concluded that large, atmospherically driven changes in ocean currents can influence estuarine conditions in San Francisco Bay. The southerly extension of colder waters could have allowed the southerly displacement of



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ICF Jones & Stokes
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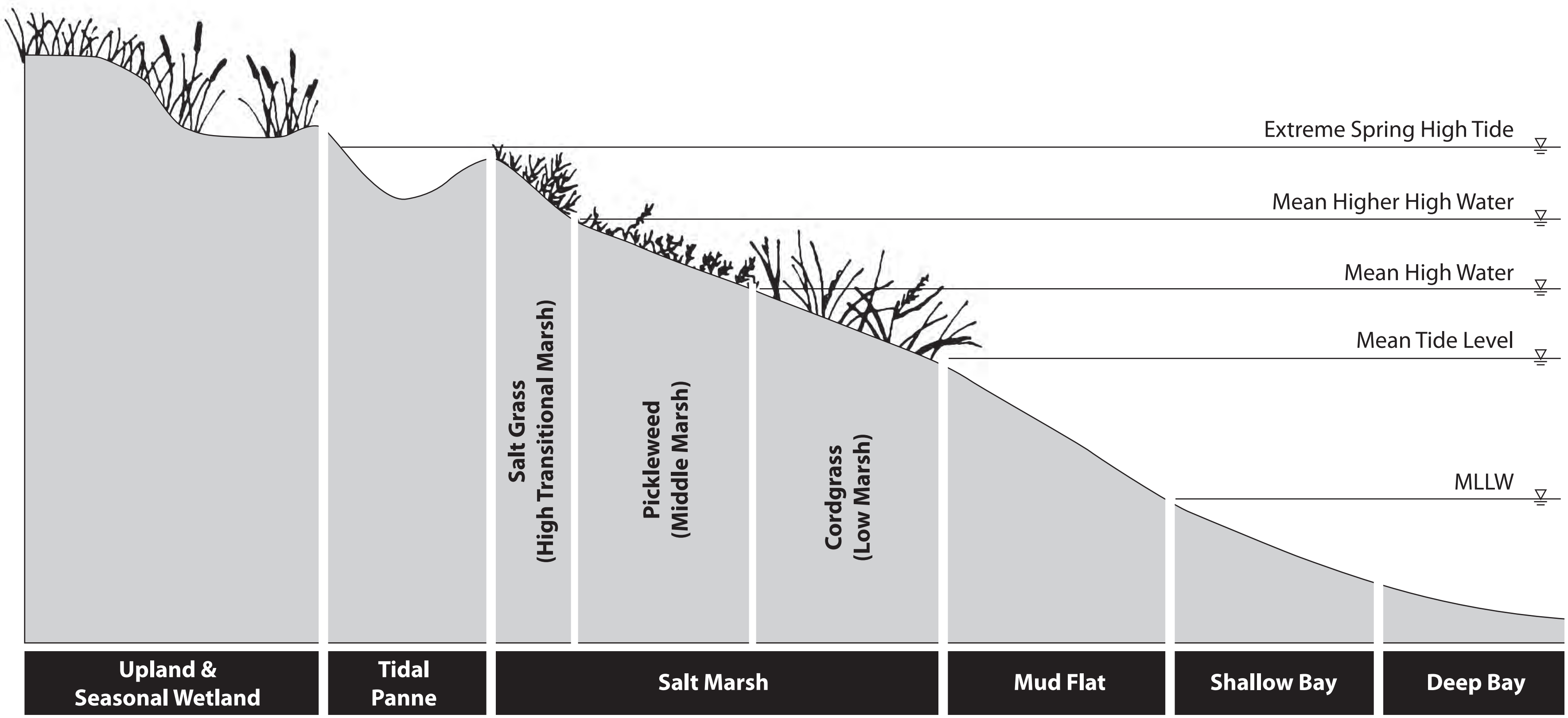
Figure 3.5-1
Aquatic Habitat in San Pablo Bay



Source: Adapted from Woodward-Clyde 1998.

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Figure 3.5-2
Schematic of Habitats by Tide Levels

predatory species into the Bay, which negatively affected the bivalve population and subsequently positively affected the phytoplankton abundance.

Deep bay areas would be disturbed by the easternmost section of the transfer pipeline (Alternatives 1–3) and the direct channel (Alternative 4), as well as the off-loading facility (Alternative 1) and proposed ATF (Alternatives 2–3).

Shallow Bay Open Water Habitat

Shallow bays and channels include the portion of the project area where the bottom is entirely between 18 feet (5.5 m) below MLLW. Shallow bay habitats are areas of continuous open water that are submerged during even the lowest tide; as a result, these areas are too deep to support the types of vegetation found in emergent (i.e., occasionally exposed) marsh habitat. The sediments of shallow bays and channels in San Pablo Bay are primarily mud. Shallow bays and channels are important for many invertebrates, fish, and water birds. This rich environment is an especially productive feeding area for many fish, including northern anchovy, sturgeon, and jacksmelt. It is also an important migratory corridor for anadromous fish such as Chinook salmon, steelhead, green sturgeon, and lamprey. The benthic (bottom dwelling) communities found in shallow water habitats are identical to those discussed in the *Deep Bay Open Water Habitat* section above. A few of the many bird species that occur in this habitat include western grebe (*Aechmophorus occidentalis*), American wigeon (*Anas Americana*), canvasback (*Aythya valisineria*), Forster's tern (*Sterna forsteri*), least tern (*Sterna antillarum*), surf scoters (*Melanitta perspicillata*), greater scaup (*Aythya marila*) and lesser scaup (*Aythya affinis*). Harbor seals and sea lions also utilize this habitat.

The portion of the dredged material transfer pipeline which traverses a portion of the shallow bay, tidal flat, and tidal salt marsh habitats already exists. This 1,700-foot-long (518 m) steel pipeline was built along an existing access road through the tidal salt marsh. However, it is possible that the existing pipeline will need to be replaced at least once during the project's lifetime.

Shallow bays would be disturbed by the majority of the transfer pipeline (Alternatives 1–3) and the direct channel to BMKV basin (Alternative 4).

Eelgrass. Eelgrass (*Zostera marina*) is a flowering plant that grows underwater in estuaries and in shallow coastal areas (generally at an average 6.5 feet [2 meters] in depth). Submerged eelgrass beds are an important biological resource and serve as a major source of primary production and as foraging and breeding habitat for various forms of fishes, birds, and invertebrates (Caltrans and NOAA Fisheries 2004). Pacific herring (*Clupea pallasi*) spawn in these beds; black brants (*Branta bernicla*) feed on them as they travel the Pacific flyway; and least terns (*Sterna antillarum browni*) forage on small fishes found in these habitats. Eelgrass beds provide refuge and a place for various organisms to hide from predators (Goals Project 1998). They are important habitat for juvenile fish such as juvenile salmon and for open marine fish and invertebrates valued as both commercial and recreational resources. Certain species forage on the epiphytic growth on eelgrass leaves. In addition to providing forage, eelgrass helps to improve water quality by trapping and removing suspended particulates, supplies organic material to nearshore environments, reduces erosion by stabilizing sediment, is important in nutrient cycling, and produces oxygen when light is available (Caltrans and NOAA Fisheries 2004).

Eelgrass grows in relatively few locations within the Bay and requires special conditions to flourish. Presence of these plants is limited by several factors. Eelgrass is generally found on mudflats and along the fringes of shallow bays where enough light is available. However, wave action and desiccation stress prevent eelgrass from growing in very shallow areas.

Eelgrass beds can consist of a few plants, scattered clumps, or dense patches. Beds will change seasonally and annually in terms of location, size, and density. No eelgrass beds exist in the immediate project area. Two eelgrass beds were identified in 2003 within the project area: the largest known eelgrass bed (1,500 ac [607 ha]) in San Francisco Bay is located between Pinole Point and Point San Pablo; and a small patch is located on the northern shoreline of Point Pinole Regional Park east of Pinole Point. The large bed is the largest known eelgrass bed in all of San Francisco Bay. In 2003, this bed alone accounted for over 50% of the known eelgrass extent in San Francisco Bay. These mapped eelgrass beds are at least 1.4 mi (2.2 km) from areas that would be disturbed by the project.

Tidal Flats

Tidal flat habitat includes mudflats, sandflats, and shell flats, and is usually comprised of less than 10% vascular vegetation. This habitat occurs from below MLLW to Mean Tide Level (MTL). Tidal mudflats have a substrate consisting of fine-grained silts and clays that are exposed twice daily during low tide and extend to the extreme low water elevation (see Figure 3.5-2). Narrow bands of mudflat are also found at the same elevations along the margins of subtidal channels in tidal marshes.

Tidal mudflats are highly productive and support large populations of benthic organisms, including aquatic worms, crustaceans, and mollusks that are important elements of the estuarine food web. When exposed or covered by shallow water, mudflats provide important foraging areas for migrant and wintering shorebirds, wading birds, and gulls. Some shorebird species that utilize bay tidal mudflats for feeding include semipalmated plover (*Charadrius semipalmatus*), black-bellied plover (*Pluvialis squatarola*), American avocet (*Recurvirostra americana*), long-billed curlew (*Numenius americanus*), willet (*Catoptrophorus semipalmatus*), marbeled godwit (*Limosa fedoa*), western sandpiper (*Calidris mauri*), dunlin (*Calidris alpine*), whimbrel (*Numenius phaeopus*), sanderling (*Calidris alba*), greater yellowlegs (*Tringa melanoleuca*), and least sandpiper (*Calidris minutilla*).

As described above, the portion of the transfer pipeline that crosses a portion of the shallow bay, the tidal flat, and tidal salt marsh habitat already exists, though it may need to be replaced. Tidal flat habitat would be disturbed by the western portion of the transfer pipeline (Alternatives 1–3) and the direct channel to BMKV basin (Alternative 4).

Tidal Marsh

Tidal marsh habitat is vegetated wetland that is subject to tidal action. It occurs from the lowest extent of vascular vegetation to the maximum height of the tides (top of the intertidal zone). This habitat may also exist in the tidal reaches of rivers and streams. Tidal marsh may be classified as tidal salt marsh or tidal brackish marsh, depending on how much freshwater influence there is. The plant communities of these two types of tidal marsh may differ greatly. In addition to salinity, other factors that may influence plant community types include substrate, wave energy, marsh age, sedimentation, and erosion. The habitat within the project area can be defined as tidal salt marsh.

Tidal salt marsh is found along the Sonoma, Napa, Contra Costa, and Marin shorelines in San Pablo Bay. Tidal salt marsh contains persistent, rooted herbaceous vegetation dominated by cordgrass (*Spartina foliosa*) and pickleweed (*Salicornia virginica*). The vegetation in the marsh habitat is used as direct cover and sources of food by rearing juvenile and adult fish such as longfin smelt, Chinook salmon, and steelhead. Emergent marsh habitat, however, is within the tidal zone and drains frequently; it is therefore not used for spawning. Benthic organisms use this habitat in the same way they use intertidal mudflats. Emergent marsh habitat also provides nesting, foraging, and escape cover for various songbirds and wading birds.

Emergent marsh habitat can be divided into three distinct zones based on frequency and duration of tidal inundation.

- Low marsh occupies the elevations between mean tide level (MTL) and MHW, and is therefore inundated daily. In the project areas, low marsh is adjacent to the open waters of San Pablo Bay and is dominated by California cordgrass.
- Middle marsh habitat occupies the elevations between MHW and MHHW and is dominated by common pickleweed. Middle marsh is inundated frequently throughout each month, although for shorter periods than is low marsh.
- High transitional marsh habitat occupies the elevations between MHHW and the highest tide level. This habitat is inundated infrequently and for short periods. This habitat supports species that are tolerant of saline conditions but not adapted to frequent, long-term inundation, including pickleweed, and halophytes such as saltgrass (*Distichlis spicata*), alkali heath (*Frankenia salina*), and fat-hen (*Atriplex triangularis*). Additional plants that may be found in tidal marsh are marsh rosemary (*Limonium californicum*), jaumea (*Jaumea carnosa*), and dodder (*Cuscuta salina*), a parasite on pickleweed.

Tidal salt marsh community provides food, cover, and breeding habitat for many wetland-dependent wildlife species. The dense vegetation and large invertebrate populations typically associated with salt marshes provide ideal foraging conditions for a variety of bird species. Low marsh and middle marsh habitat provides important foraging habitat for special status species such as the California clapper rail (*Rallus longirostris*), California black rail (*Laterallus jamaicensis*), and saltmarsh harvest mouse (*Reithrodontomys raviventris*). These lower elevation marsh habitats do not provide sufficient core or nesting habitat for these species since they are inundated regularly. High transitional marsh habitat does provide suitable nesting habitat for shorebird and waterfowl species, including the California clapper rail and California black rail. If these high marsh habitats support dense stands of pickleweed, they typically support core populations of saltmarsh harvest mouse as well.

In addition to being important habitat for wetland-associated wildlife, the tidal salt marsh community is an important component of San Pablo Bay ecosystem, providing nutrients and organic matter to the mudflats and open water of the Bay. Some bird species associated with tidal salt marsh habitat include snowy egret (*Egretta thula*), northern harrier (*Circus cyaneus*), California clapper rail (*Rallus longirostris*), California black rail (*Laterallus jamaicensis*), willet, short-eared owl (*Asio flammeus*), salt marsh yellowthroat (*Geothlypis trichas sinuosa*), Alameda song sparrow (*Melospiza melodia pusillula*), San Pablo song sparrow (*Melospiza melodia samuelis*), and Suisun song sparrow (*Melospiza melodia maxillaries*). Small mammal species that primarily utilize tidal marsh habitat include salt marsh wandering shrew (*Sorex vagrans halicoetes*), Suisun shrew (*Sorex ornatus sinuosus*), and salt marsh harvest mouse (*Reithrodontomys raviventris*).

As described above, the portion of the transfer pipeline that crosses the shallow bay, tidal flat, and tidal salt marsh habitat already exists, though it may need to be replaced. Tidal salt marsh located between the outboard levee and the open water of San Pablo Bay may be disturbed by the dredged material delivery pipeline (Alternatives 1–3) and the direct channel route (Alternative 4).

Terrestrial Habitats

Within the project area, terrestrial habitats are defined as all non-tidal wetland and upland habitats that are landward of the outboard levee. Several terrestrial habitats occur on the BMKV site, including annual grassland, agricultural lands, and many types of wetlands (see Figure 4-8 in the 2003 BMKV SEIS/EIR). The BMKV SEIS/EIR fully describes the various types of upland habitats on the site, and is incorporated by reference in this document. This SEIS/EIR focuses on the terrestrial communities that would be affected by excavation of the BMKV basin only – a 60-ac (about 24 ha) portion of the agricultural lands.

While the terrestrial communities are discussed separately in this section to capture the unique habitat features that are found in each, they are collectively referred to as “upland habitat” for the duration of the document.

Most of the BMKV site is composed of agricultural fields that are planted and harvested annually. Approximately 75% of these lands are managed for oat hay production. Following the harvest, fields remain fallow until the following planting season. When fallow, the fields typically support nonnative invasive plants, such as star thistle (Environmental Science Associates, Inc. 1993). Cultivated fields, particularly when fallow, provide habitat similar to grasslands and provide foraging habitat for raptors, water birds, waterfowl, songbirds, and small mammals. The BMKV basin in Alternative 4 would be limited to 60 ac (about 24 ha) adjacent to the outboard levee that is currently used for agriculture.

The BMKV site contains several types of non-tidal wetland communities: coastal salt marsh, small amounts of brackish marsh in the drainage ditches, and seasonal wetland. In addition, seasonal ponding occurs within the cultivated fields, though it varies in magnitude from year to year. Delineation of jurisdictional wetlands was completed for the BMKV site (LSA Associates 1997) and verified by USACE and the Natural Resources Conservation Service (NRCS).

During winter, some of the agricultural fields on the BMKV site become saturated or seasonally flooded with runoff from precipitation. Flooded fields provide foraging and loafing habitat for a wide diversity of wintering and migrant shorebirds, waterfowl, and other water birds during winter. Based on a statistically derived average ponding area, approximately 151 ac (61 ha) of agricultural wetlands were delineated on the BMKV site (LSA Associates 1997). Ponding can vary annually in location and size, so these areas have not been mapped. Similarly, for the BMKV basin site itself, the exact area of potential agricultural wetlands within the BMKV basin has not been mapped.

Under Alternatives 1-3, terrestrial habitats would not be disturbed. Under Alternative 4, the outboard levee would be breached to allow tidal access from the proposed direct channel to the proposed rehandling basin on the BMKV site. Additionally, a new perimeter levee is proposed to be constructed around the BMKV basin to restrict tidal exchange into the rest of the BMKV site.

3.5.1.2 Sensitive Species

Table 3.5-1 lists sensitive marine mammal and fish species that are known to occur or have the potential to occur in the region. Table 3.5-2 provides a list of terrestrial wildlife and plant species that could occur in the region, their habitat requirements, and the likelihood that they will occur in the project area. (Both tables are provided at the end of this section.) These species were identified based on the California Natural Diversity Database (CNDDB) records search (CNDDB 2007), the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants of California (CNPS 2007) species lists provided by USFWS and the National Marine Fisheries Service (NMFS), and species distribution and habitat requirements data.

For the purpose of this document, sensitive species are plants, animals, and fish that are legally protected under the California Endangered Species Act (CESA) and the federal Endangered Species Act (ESA) or other regulations, and species that are considered sufficiently rare by the scientific community to qualify for such listing. Sensitive plants, animals, and fish fall into the following categories:

- Species listed or proposed for listing as threatened or endangered under the federal ESA (50 CFR 17.12 [listed plants], 50 CFR 17.11 [listed animals], and various notices in the Federal Register [FR] [proposed species]);
- Species that are candidates for possible future listing as threatened or endangered under the federal ESA (64 FR 57534, October 25, 1999);
- Species listed or proposed for listing by the State of California as threatened or endangered under the CESA (14 CCR 670.5);
- Species that meet the definitions of “rare” or “endangered” under CEQA (State CEQA Guidelines Section 15380);
- Marine mammals that are protected under the MMPA;
- Plants listed as rare under California Native Plant Protection Act (California Fish and Game Commission 1900 et seq.);
- Plants considered by CNPS to be “rare, threatened, or endangered in California” (e.g., CNPS List 1B and List 2) (2007);
- Animal species of special concern to the California Department of Fish and Game (CDFG) (Remsen 1978 [birds], Williams 1986 [mammals], and Jennings and Hayes 1994 [amphibians and reptiles]); and
- Animals fully protected in California (California Fish and Game Code, Sections 3511 [birds], 4700 [mammals], 5050 [amphibians and reptiles], and 5515 [fish]).

A search of the CNDDB (2007) was conducted for the nine U.S. Geological Survey (USGS) 7.5-minute quadrangles (Petaluma Point, Petaluma River, Novato, San Rafael, Sears Point, San Quentin, Cuttings Wharf, Mare Island, Richmond) that surround the project area. USFWS provided a list of sensitive wildlife species that could occur in or be affected by projects in the nine-quadrangle region mentioned above. Additional fish and wildlife species not listed on the CNDDB search report or on the USFWS list are evaluated in this document. These species were included based on professional judgment and other biological inventories of the project area. Tables 3.5-1 and 3.5-2 describe the potential for fish and wildlife species to occur in areas with suitable habitat, which are also discussed further below.

Additionally, 68 sensitive plant species have been documented in the region (see Appendix E). Of these, only six potentially have habitat in the project area and could occur within the project’s area of impact (see Table 3.5-2). Those species are discussed further below.

The following discussion describes the species that could occur in open water/subtidal habitats of San Pablo Bay at the off-loader and proposed ATF site; along the open water/subtidal, tidal mudflat, and outboard tidal marsh crossed by the pipeline; along the open water/subtidal and tidal mudflat crossed by the Alternative 4 direct channel, and within the onshore area proposed for the Alternative 4 BMKV basin.

Marine Mammals

A number of marine mammal species are observed along the central California coast, but only a few species occur with any regularity in the vicinity of San Pablo Bay. Harbor seals are the most common marine mammals in the vicinity of the project. California sea lions are also frequently observed in this area. Gray whales (*Eschrichtius robustus*) have been observed occasionally in the deep portions of San Pablo Bay. Other species, including harbor porpoise (*Phocoena phocoena*), humpback whale (*Megaptera noveangliae*), Steller sea lion (*Eumetopius jubatus*) northern elephant seal (*Mirounga angustirostris*), northern fur seal (*Callorhinus ursinus*), and the southern sea otter (*Enhydra lutris*) are observed infrequently; and most observations in San Francisco Bay are primarily in the vicinity of the Golden Gate Bridge. These latter species would not be expected to occur in the vicinity of the project except on very rare occasion, and are not discussed further.

Common Marine Mammals

Harbor seals and California sea lions are known to occur in the area of San Pablo Bay. Though neither species is reliant on the site of the proposed action during critical times of the year, both species could occur within the project area. California sea lions are far less abundant in the project area compared to harbor seals (62 FR 46480). Gray whales are observed infrequently in San Francisco Bay during their migration periods. Most are observed near the Golden Gate, but have on occasion been observed in San Pablo Bay. None of these species is currently listed under the federal ESA (gray whales were recently delisted), but all of these species are protected under the Marine Mammal Protection Act.

The following provides information on the two species which could occur with some regularity in the vicinity of the project.

Harbor Seal. Harbor seals (*Phoca vitulina richardsi*) are found north of the equator in both the Atlantic and Pacific Oceans. In the Pacific, they range from Alaska to Baja California, Mexico. They favor near-shore coastal waters and are often seen at sandy beaches, mudflats, bays, and estuaries. Harbor seals spend about half their time on land and half in water, and they sometimes sleep in the water. They are opportunistic feeders, eating sole, flounder, sculpin, hake, cod, herring, octopus, and squid (Marine Mammal Center 2006). In California, harbor seal pups are born in March and April. Adult females usually mate and give birth every year. Individuals may live 25 to 30 years. The total harbor seal population in the eastern north Pacific is estimated to be 330,000, and in California the estimated population was 40,000 in 1997. They are usually found in small groups, but sometimes occur in numbers of up to 500 (Marine Mammal Center 2006).

Harbor seals are nonmigratory and are year-round residents of San Francisco Bay. They haul-out at several locations in the Bay. Harbor seals use Sisters Rocks (approximately 2,100 yards south of the proposed ATF location) and Castro Rocks, adjacent to the Richmond–San Rafael Bridge, (approximately 7,000 yards [6,400 m] southeast) as haul-out sites for resting and breeding. Castro Rocks is the largest haul-out site in the North Bay and the second largest breeding site in

Francisco Bay. Harbor seals also use Lower Tubbs Island as a haul-out site (approximately 11,000 yards [10,058 m] northeast of the proposed ATF location). Harbor seals may forage in San Pablo Bay.

California Sea Lion. California sea lions (*Zalophus californicus*) are found from Vancouver Island, British Columbia, to the southern tip of Baja California in Mexico. They breed mainly on offshore islands, ranging from southern California's Channel Islands south to Mexico, although a few pups have been born on Año Nuevo and the Farallon Islands in central California. There is a distinct population of California sea lions at the Galapagos Islands. A third population in the Sea of Japan became extinct, probably during World War II (Marine Mammal Center 2006). California sea lions are opportunistic eaters, feeding on squid, octopus, herring, rockfish, mackerel, and small sharks. In turn, sea lions are preyed upon by Orcas (killer whales) and great white sharks. Most pups are born in June or July and nurse for at least 5 to 6 months and sometimes over a year. The California sea lion population is growing steadily, and California sea lions can be seen in many coastal spots. The current population is approximately 200,000 (Marine Mammal Center 2006).

California sea lions primarily use the central San Francisco Bay to feed. Shortly after the 1989 Loma Prieta earthquake, they hauled out on PIER 39's K-Dock in San Francisco. Although they are occasionally observed on Castro Rocks, no pupping or regular haul sites are located in San Pablo Bay. California sea lions may forage in San Pablo Bay.

Fish Species

Common Fish Species

San Pablo Bay is essential habitat for dozens of fish species, including commercially fished Pacific herring (*Clupea pallasii*), sport fishes like striped bass (*Morone saxatilis*), bottom dwellers like California halibut (*Paralicthys californicus*) and leopard shark (*Triakis semifasciata*), and a variety of less familiar species such as starry flounder (*Platichthys stellatus*), surfperch (*Embiotoca* sp.), bat ray (*Myliobatis californica*), English sole (*Parophrys vetulus*), and delta smelt (*Hypomesus transpacificus*).

San Francisco Bay provides habitat for many life stages of the Dungeness crab *(Cancer magister)*. The *C. magister* larvae float in the water column of the ocean until about 4 to 6 months after birth when they settle to the bottom of the water column and make their way to bay environments, such as San Francisco Bay. Juvenile and adult *C. magister* are bottom foragers, feeding on fish, clams, and other crustaceans. In turn, *C. magister* are preyed upon by flounder, sole, and other bottom-feeding fish species. Spawning generally takes place in early- to mid-spring and fertilized eggs remain in the female until hatching. Each female can produce as many as 2 million eggs and may have four broods over her lifetime. Juveniles are most abundant in San Pablo Bay with abundance decreasing further south. Adults seek out structurally complex habitats, rather than exposed mud and sand, possibly due to protection against predation. However, almost any substrate can support the *C. magister* (RWQCB 2000).

Special-Status Fish Species

No special-status fish surveys were conducted for the proposed action. Based on existing fisheries information for San Pablo Bay, nine special-status fish species (three evolutionarily significant units [ESU] of Chinook salmon, two distinct populations segments [DPS] of steelhead, green sturgeon, longfin smelt (under consideration for listing by USFWS), river lamprey, and Sacramento splittail) are presumed to be present in the project area (see Table 3.5-1). For anadromous species such as Chinook salmon, steelhead, and green sturgeon, San Pablo Bay is a critical migratory pathway between the Pacific Ocean and spawning areas in the Bay's tributary rivers. Delta smelt, a fish listed as threatened under the federal and state ESAs, can occur in the northern portion of San Pablo Bay, but because of its narrow salinity tolerance (typically not found in waters greater than 14 ppt) would not be expected in the area of the proposed action or alternatives (Bennett 2005).

Chinook Salmon. Four distinct runs of Chinook salmon (*Oncorhynchus tshawytscha)* occur in the San Francisco Bay-Delta system: winter-run, spring-run, fall-run, and late fall–run. Chinook salmon are anadromous fish, meaning that adults live in marine environments and return to their natal freshwater streams to spawn. Juveniles rear in freshwater for a period as long as 1 year until smoltification (i.e., a physiological preparation for survival in marine environs) and subsequent ocean residence.

Winter-Run Chinook Salmon. Both ESA and CESA list the winter-run Chinook salmon ESU as an endangered species. Critical habitat for winter-run Chinook salmon includes the Sacramento River from Keswick Dam (River Mile [RM] 302) to Chipps Island (RM 0) in the Delta and westward from the Carquinez Bridge including San Pablo and San Francisco Bays (58 FR 33213, June 16, 1993).

Adult winter-run Chinook salmon immigration (upstream migration) through the Delta and into the Sacramento River occurs from December through July, with peak immigration from January through April. Winter-run Chinook salmon primarily spawn in the mainstem Sacramento River between Keswick Dam (RM 302) and the Red Bluff Diversion Dam (RM 242). Winter-run Chinook salmon spawn between late April and mid-August, with peak spawning generally occurring in June (Snider et al. 2000).

Juvenile emigration (downstream migration) past the Red Bluff Diversion Dam (RM 242) begins in late July, peaks during September, and may extend through mid-March (NMFS 1997). The peak period of juvenile emigration through the lower Sacramento River into the Delta generally occurs between January and April (NMFS 1997). Differences in peak emigration periods between these two locations suggest that juvenile winter-run Chinook salmon may exhibit a sustained residence in the upper or middle reaches of the Sacramento River before entering the lower Sacramento River/Delta. Although the location and extent of rearing in these lower or middle reaches is unknown, it is believed that the duration of fry presence in an area is directly related to the magnitude of river flows during the rearing period (Stevens 1989). Little is known about the transit time of winter run Chinook salmon through the north Bay; however, a recent tracking study indicated that transit times are rapid, on the order of an hour for Chinook salmon (see discussion below for fall run Chinook salmon).

Central Valley Spring-Run Chinook Salmon. The Central Valley spring-run Chinook salmon ESU, which includes populations spawning in the Sacramento River and its tributaries, is listed as threatened under ESA and CESA. Spring-run Chinook salmon historically occurred from the upper tributaries of the Sacramento River to the upper tributaries of the San Joaquin River. However, they have been extirpated from the San Joaquin River system. The only streams in the Central Valley with remaining wild spring-run Chinook salmon populations are the Sacramento River and its tributaries, including the Yuba River, Mill Creek, Deer Creek, and Butte Creek. Critical habitat is designated for spring-run Chinook salmon and encompasses the same area as winter-run, but excludes San Pablo Bay (70 FR 52531, September 2, 2005).

Spring-run Chinook salmon enter the Sacramento River from late March through September (Reynolds et al. 1993), but peak abundance of immigrating adults in the Delta and lower Sacramento River occurs from April through June. Adult spring-run Chinook salmon remain in deep-water habitats downstream of spawning areas during summer until their eggs fully develop and become ready for spawning. This is the primary characteristic that distinguishes spring-run Chinook salmon from the other runs. Spring-run Chinook salmon spawn primarily upstream of the Red Bluff Diversion Dam and in the aforementioned tributaries. Spawning occurs from mid-August through early October (Reynolds et al. 1993). A small portion of an annual year-class may emigrate as post-emergent fry (less than 1.8 inches long [4.6 centimeters (cm)]) and reside in the Delta undergoing smoltification. However, most are believed to rear in the upper river and tributaries during winter and spring, emigrating as juveniles (more than 1.8 inches long [4.6 cm]). The timing of juvenile emigration from the spawning and rearing reaches can vary depending on tributary of origin and can occur from November through June. As noted below (under the discussion of fall run Chinook salmon), these outmigrants are not expected to occur for extended periods of time in San Pablo Bay.

Central Valley Fall-Run and Late Fall–Run Chinook Salmon. Central Valley fall-run and late fall–run Chinook salmon are commercially and recreationally important. This ESU is not listed as a threatened or endangered species under the federal ESA, but is a federal candidate species and a state species of special concern. Because the fall-run Chinook salmon is currently the largest run of Chinook salmon in the Sacramento River system, it continues to support commercial and recreational fisheries of significant economic importance.

In general, adult fall-run Chinook salmon migrate into the Sacramento River and its tributaries from July through December, with immigration peaking from mid-October through November. Fall-run Chinook salmon spawn in numerous tributaries of the Sacramento River, including the lower American River, lower Yuba River, Feather River, and tributaries of the upper Sacramento River. Most mainstem Sacramento River spawning occurs between Keswick Dam and the Red Bluff Diversion Dam. A greater extent of fall-run spawning, relative to the other three runs, occurs below the Red Bluff Diversion Dam, with limited spawning potentially occurring as far downstream as Tehama (RM 220) (Yoshiyama et al. 1996). Spawning generally occurs from October through December, with fry emergence typically beginning in late December and January. Fall-run Chinook salmon emigrate as post-emergent fry, juveniles, and smolts after rearing in their natal streams for as long as 6 months. Consequently, fall-run emigrants may be present in the lower Sacramento River from January through June (Reynolds et al. 1993) and remain in the Delta for variable lengths of time before ocean entry.

Adult immigration of late fall–run Chinook salmon into the Sacramento River generally begins in October, peaks in December, and ends in April (Moyle et al. 1995). Primary spawning areas for late fall–run Chinook salmon are located in tributaries of the upper Sacramento River (e.g., Battle Creek, Cottonwood Creek, Clear Creek, Mill Creek), although late fall–run Chinook salmon are believed to return to the Feather and Yuba Rivers as well (Moyle et al. 1995). Spawning in the mainstem Sacramento River occurs primarily from Keswick Dam (RM 302) to the Red Bluff Diversion Dam (RM 258), generally from January through April (Moyle et al. 1995). Juveniles emigrate through the lower Sacramento River primarily from October through April.

More recent, though limited, studies of salmon and steelhead migration indicate that emigrating juvenile salmon and steelhead have a relatively short residence time in the area of San Pablo Bay (USACE 2007). As part of the first year pilot study to determine the feasibility of the outmigrant tracking program, USACE implanted acoustic transmitter tags in juvenile fall run Chinook salmon and steelhead, which were tracked by a number of hydroacoustic monitoring stations between the Benicia-Martinez Bridge and the Golden Gate Bridge. These early data estimated the mean travel time of Chinook salmon and steelhead in the area of SF10 at 70 and 2.5 minutes, respectively. Also both species tended to use deeper areas around the Richmond San Rafael Bridge rather than the shallower areas.

Steelhead. Steelhead (*Oncorhynchus mykiss)*, an anadromous variant of rainbow trout, is closely related to Pacific salmon. The species was once abundant in California coastal and Central Valley drainages. However, population numbers have declined significantly in recent years, especially in the tributaries of the Sacramento River. Steelhead typically migrate to marine waters after spending 1 year or more in fresh water. In the marine environment, they typically mature for 1 to 3 years before returning to their natal stream to spawn as 3- or 4-year-olds. Unlike other Pacific salmon, steelhead are capable of spawning more than once before they die. The steelhead spawning season typically stretches from December through April. After several months, fry emerge from the gravel and begin to feed. Juveniles rear in freshwater from 1 to 4 years (usually 2 years), then migrate to the ocean as smolts. Both DPSs have similar life history characteristics and are separated based on geographical range. Also, as noted above (under the discussion of fall run Chinook salmon), these outmigrants are not expected to occur for extended periods of time in San Pablo Bay.

Central Valley Steelhead. The Central Valley steelhead (*O. mykiss*) is listed as threatened under the ESA (63 FR 53:13347-13371, March 19, 1998). Critical habitat is designated and includes the Sacramento River north of Redding extending south to the San Joaquin below the Tuolumne River. Critical habitat is also designated for all the tributaries on the Sacramento and San Joaquin Rivers. San Pablo Bay is excluded from the designation (70 FR 52532, September 2, 2005).

Central California Coast Steelhead. Central California Coast steelhead was listed as threatened by NMFS on August 18, 1997 (62 FR 43938). Critical habitat for Central California Coast steelhead is designated in the Russian River, north of Ukiah (including coastal tributaries), extending southward to Santa Cruz and its coastal tributaries. San Pablo and San Francisco Bay are excluded from the designation (70 FR 52530, September 2, 2005).

Green Sturgeon. Green sturgeon are divided into two DPSs: northern and southern DPSs. The northern DPS includes populations extending from the Eel River northward, and the southern DPS includes populations south of the Eel River to the Sacramento River. The Sacramento River supports the southernmost spawning population of green sturgeon (Moyle 2002).

On April 7, 2006, the NMFS issued a final rule listing the Southern DPS of North American green sturgeon (*Acipenser medirostris)* as a threatened species. This threatened determination was based on the reduction of potential spawning habitat, the severe threats to the single remaining spawning population, the inability to alleviate these threats with the conservation measures in place, and the decrease in observed numbers of juvenile Southern DPS green sturgeon collected in the past two decades compared to those collected historically (71 FR 17757 April 7, 2006). Green sturgeon are anadromous, but are also the most marine-oriented of the sturgeon species, coming into rivers mainly to spawn, although early life stages in freshwater and estuaries may last as long as 1 to 3 years. Green sturgeon do not spawn every year, and it is believed that the majority of adult green sturgeon are in the ocean at any given time.

Sub-adults and adults enter the San Francisco estuary in the spring and remain through fall (Kelly et al. 2007). Adults typically migrate upstream into rivers between late February and late July.

Spawning occurs from March to July, with peak spawning from mid-April to mid-June. Green sturgeon are believed to spawn every 3 to 5 years, although recent evidence indicates that spawning may be as frequent as every 2 years (70 FR 17386). Little is known about the specific spawning habitat preferences of green sturgeon. It is believed that adult green sturgeon broadcast their eggs in deep, fast water over large cobble substrate where the eggs settle into the interstitial spaces (Moyle 2002). Spawning is generally associated with water temperatures from 8 to 14°C (46 to 57ºF). In the Central Valley, spawning occurs in the Sacramento River upstream of Hamilton City, perhaps as far upstream as Keswick Dam (Moyle 2002).

Larval green sturgeon begin feeding 10 days after hatching, and metamorphosis to the juvenile stage is complete within 45 days of hatching. Larvae grow quickly, reaching about 3 inches (74 millimeters [mm]) in the first 45 days after hatching and about 12 inches (300 mm) by the end of the their first year (70 FR 17386). Downstream dispersal of larval sturgeon about 0.75 inch to 2.35 inches (20 to 60 mm) from the Upper Sacramento occurs between May and August (Beamesderfer et al. 2006). Juveniles are sensitive to salinity until approximately 6 months of age (Beamesderfer et al. 2006) so they spend 1 to 3 years in freshwater or estuaries before they enter the ocean.

Little is known about the movements and habits of green sturgeon. Green sturgeon salvaged at the state's John E. Skinner Delta Fish Protective Facility in Byron and the federal Tracy Fish Collection Facility in Tracy every month, indicates that they are present in the Delta year-round. Between January 1993 and February 2003, a total of 99 green sturgeon were salvaged at the state and federal fish salvage facilities; no green sturgeon were salvaged in 2004 or 2005 (Interagency Ecological Program 2005). The proposed ATF basin location is within an area named the "Sturgeon Triangle" where anglers target adult white sturgeon. The numbers of adults, subadults, and juvenile green sturgeon captured in the trammel net surveys in San Pablo Bay vary from year to year, from five to 110 (Kelly et al. 2007; CDFG, 2002).

In more recent studies, researchers captured five sub-adult and one adult green sturgeon from San Pablo Bay, inserted ultrasonic transmitters into them, and tracked their depth and movement (Kelly et al. 2007). Four of the five sub-adult fish remained in San Pablo Bay, typically in water depths shallower than 10 m (about 33 feet). The fifth sub-adult moved over 45 km (about 28 mi) up the Delta before it was lost. The sub-adults demonstrated both non-directional and directional movement. Non-directional behavior accounted for 63.4% of the observations, and with fish slowly moving along the bottom and changing direction frequently. Directional movements occurred in the top 20% of the water column and consisted of fish swimming a steady course for extended periods. The one adult sturgeon that was tagged in San Pablo Bay exited San Francisco Bay within 6 hours of being tagged. Given the documented occurrences of green sturgeon in San Pablo Bay, it is presumed that green sturgeon could be present in the project area.

River Lamprey. River lamprey (*Lampetra ayresii)* is a state species of special concern. River lamprey are relatively small (averaging 6.7 inches long [17 cm]) and highly predaceous. They are anadromous and will attack fish in both fresh and saltwater (Moyle 2002). A great deal of what is known about the species is based on populations in British Columbia. There, adults migrate from the Pacific Ocean into rivers and streams in September and spawn in winter. Adults excavate a saucer-shaped depression in sand or gravel riffles where eggs are deposited. After spawning, the adults perish. Juvenile river lamprey, called ammocoetes, remain in backwaters for several years, where they feed on algae and microorganisms (Moyle et al. 1986). The metamorphosis from juvenile to adult begins in July and is complete by the following April. From May through July, following completion of metamorphosis, river lamprey aggregate in the Delta before entering the ocean.

River lamprey is distributed in streams and rivers along the eastern Pacific Ocean from Juneau, Alaska, to San Francisco Bay. It may have its greatest abundance in the Sacramento and San Joaquin River systems, although it is not commonly observed in large numbers (Moyle et al. 1986).

Longfin Smelt. On February 7, 2008, the California Fish and Game Commission voted to designate the longfin smelt (*Spirinchus thaleichthys*) as a "candidate species" for listing under the CESA. USFWS is currently evaluating potential listing of longfin smelt. Historically, longfin smelt populations were found in the Klamath, Eel, and San Francisco estuaries, and in Humboldt Bay. From current sampling, populations reside at the mouth of the Klamath River and the Russian River estuary. In the Central Valley, longfin are rarely found upstream of Rio Vista or Medford Island in the Delta. Adults concentrate in Suisun, San Pablo and North San Francisco Bays (Moyle 2002).

Longfin smelt are anadromous, euryhaline and nektonic. Adults and juveniles are found in estuaries and can tolerate salinities from 0 ppt to pure seawater. After the early juvenile stage, they prefer salinities in the 15 to 30 ppt range (Moyle 2002).

Longfin smelt are found in San Pablo Bay in April through June and disperse in late summer. In the fall and winter, yearlings move upstream into fresh water to spawn. Spawning occurs below Medford Island in the San Joaquin River and below Rio Vista on the Sacramento River. Spawning may happen as early as November, and larval surveys indicate it may extend into June (Moyle 2002).

Embryos hatch in 40 days at about 45°F (7°C) and are buoyant. They move into the upper part of the water column and are carried into the estuary. High outflows transport the larvae into Suisun and San Pablo Bays. In low outflow years, larvae move into the western Delta and Suisun Bay. Higher outflows reflect positively in juvenile survival and adult abundance (Rosenfield and Baxter 2007). Rearing habitat is better in Suisun and San Pablo Bays since juveniles require brackish water in the 2 to 18 ppt range. Recent studies by Rosenfield and Baxter (2007) indicate that post larval longfin smelt display a depth-stratified distribution and seem to aggregate in deep-water habitats (catch per unit effort was consistently, although not significantly, higher at channel stations vs. shoal stations).

Sacramento Splittail. Sacramento splittail (*Pogonichthys macrolepidotus*) is a cyprinid endemic to the central valley, with its range centering within San Francisco Bay. The splittail is a state species of special concern but was delisted as a threatened species by the USFWS in 2003 (68 FR 55139). The Sacramento splittail is one of the most distinctive cyprinids in North America, sharing its genus with only one other extinct species, the Clear Lake splittail (*P. cisoides*).

Moyle et al. (2004) provide a comprehensive review of the biology and population dynamics of the Sacramento splittail. Splittail begin a gradual migration upriver as adults between late November and late January and spawn on seasonally inundated floodplains from late February to early July, with a peak in March and April. Splittail eggs are demersal and adhesive, attaching to submerged vegetation or substrate. Larvae are capable of active swimming at 20-25 mm (0.7 – 0.9 inches) total length (TL), and are strongly associated with shallow edge habitat. They begin using a variety of offshore habitats by 29 mm (1.1 inch). As waters recede and temperatures increase, usually in May, juveniles migrate downstream to shallow, brackish rearing grounds where they feed for 1 to 2 years before maturity.

Historically, splittail occurred in low-elevation habitats throughout the Sacramento and San Joaquin valleys, but were most abundant in the estuary. Today, they are found frequently in the Sacramento River below the mouth of the Feather River, and less commonly in the San Joaquin River below Salt Slough in wet years and below the Tuolumne River confluence in dry years. In the Bay Area, they occur in the margins of Central and South Bay during wet years, but are more commonly found in the Sacramento-San Joaquin Delta, Suisun Bay, Suisun Marsh, the lower Napa River and the lower Petaluma River.

Splittail are remarkably tolerant of wide ranges of temperature, salinity and dissolved oxygen and are strong swimmers. While they tend to be more abundant in areas of lower salinity, splittail are regularly found at salinities of 10 ppt to 18 ppt, and adults can tolerate salinities up to 29 ppt. They can be found in waters with temperatures ranging from 5 to 24 °C (about 41 to 75°F), but can survive temperatures of 33 °C (about 91 °F) when acclimatized. Fish sampling programs such as the University of California, Davis (UCD)'s Suisun Marsh Survey have shown that splittail populations have high natural variability, a reflection of their life history strategy, some successful reproduction occurs each year, and the largest numbers of young are produced only during years of relatively high outflow. In the area of San Pablo Bay, juvenile splittail would most commonly be found at depths less than 3 to 6 feet (1 to 2 m), in tidal, turbid, brackish and soft-bottomed habitat. As adults, splittails are bottom-oriented rovers that feed on benthic crustaceans whose optimal habitat is in channels of the estuary with significant current from rivers or tide. The highest densities are found in the northwest delta, Suisun Bay and Suisun Marsh, and the lower reaches of the tributary streams to Suisun and San Pablo Bays.

Wildlife Species

The following special status wildlife species with potential to occur within the project area were identified for the proposed action and alternatives.

Special Status Wildlife Species

California Brown Pelican. The California brown pelican (*Pelecanus occidentalis californicus*) is listed as state endangered and is currently proposed for delisting under the federal ESA. It is one of six recognized subspecies of brown pelican. These pelicans nest from the Channel Islands of southern California southward along the Baja California coast and in the Gulf of California to coastal southern Mexico (CDFG 2000a). They build nests of sticks on the ground, typically on islands or offshore rocks. Non-breeding California brown pelicans range northward along the Pacific Coast from the Gulf of California to Washington and southern British Columbia.

Though San Pablo Bay is outside of the known breeding range of this species, the Bay does provide foraging habitat. Brown pelicans dive from flight to capture surface-schooling marine fishes, primarily mackerel, sardines, and anchovies. Roosting and loafing sites provide important resting habitat for breeding and non-breeding birds. Important roosting sites include offshore rocks and islands, river mouths with sand bars, breakwaters, pilings, and jetties along the Pacific Coast and in San Francisco Bay (CDFG 2000a).

Double-Crested Cormorant. The double-crested cormorant (*Phalacrocorax auritus)* is a California species of concern. In California, most individuals nest coastally with some nesting in interior lakes in northern California. This species nests in small numbers in San Francisco Bay, though the numbers of nests may be increasing on human structures (radio and electric towers) in the Bay Area in general (Remsen 1978).

Cormorants require suitable places for daytime resting or loafing and nighttime roosts. Between bouts of fishing, cormorants spend much of their time perching on exposed sites such as rocks or sandbars, pilings, high-tension wires, or trees. Individuals must visit these perches several times a day to dry plumage. Such loafing areas may also be nighttime roosts for some individuals, but roosts are often more remote and used by larger numbers. Most individuals forage in shallow water (<26 feet deep [about 29 m]), typically <19 mi (30 km) from a colony or roost, often within sight of land (CDFG 1978).

Osprey. The osprey (*Pandion haliaetus*), a California species of special concern, has been found breeding in a few areas of northern California, from the Cascade Ranges south to Lake Tahoe, and along the coast south to Marin County (Zeiner et al. 1990). Habitat consists of a large, clear, open body of water with an adequate supply of fish. Ospreys typically forage in shallow areas (1.5–6 feet deep [0.5 – 1.8 m]) by swooping from flight, hovering, or perching to catch fish near the surface of the water (Zeiner et al. 1990; Poole et al. 2002). Nesting sites are generally elevated, open, and free from predators, and may include large snags, dead-topped trees, cliffs, rocks, or man-made structures such as towers.

Ospreys are observed in San Pablo Bay (USFWS 1987), and regularly forage in the shallow, subtidal areas. There are no CNDDB (2007) records of ospreys nesting in San Pablo Bay, though there is a possibility they may nest on abandoned isolated structures along the shoreline and in the subtidal areas.

California Black Rail. The California black rail (*Laterallus jamaicensis coturniculus*) is listed as threatened in California. It is also fully protected by the state.

The majority of California black rails (>90%) are found in the tidal salt marshes of the northern San Francisco Bay region, primarily in San Pablo and Suisun Bays. Smaller populations occur in San Francisco Bay, the Outer Coast of Marin County, freshwater marshes in the foothills of the Sierra Nevada, and in the Colorado River Area. Loss of more than 80% of historic tidal marsh habitat, as well as habitat fragmentation and degradation have directly and indirectly impacted this and other tidal marsh breeding species. Although there are few historic records of Black Rail presence and abundance in the Bay, recent survey efforts indicate that the species is absent from some marshes in the northern Bay region and that population sizes may be low enough to cause concern (Spautz et al 2005).

California Clapper Rail. The California clapper rail (*Rallus longirostris obsoletus)* is listed as state and federally endangered and is also fully protected by the state of California. This species is now restricted almost entirely to the marshes of San Francisco estuary, where the only known breeding populations occur (USFWS 1984 and 2006).

Distribution in the North Bay is patchy and discontinuous, with populations occurring primarily in small, isolated habitat fragments. Small groups are widely distributed throughout San Pablo Bay, and they are present in low numbers at various locations throughout the Suisun Marsh area (Albertson 1998; USFWS 1984 and 2006).

Throughout their distribution, California clapper rails occur within a range of salt and brackish marshes. In south and central San Francisco Bay and along the perimeter of San Pablo Bay, rails typically inhabit salt marshes dominated by pickleweed and Pacific cordgrass. In the North Bay (Petaluma Marsh, Napa-Sonoma marshes, Suisun Marsh), they also live in tidal brackish marshes, which vary significantly in vegetation structure and composition. Use of brackish marshes by clapper rails is largely restricted to major sloughs and rivers off San Pablo Bay and Suisun Marsh, and along Coyote Creek in south San Francisco Bay. Clapper rails have rarely been recorded in non-tidal marsh areas (USFWS 2006). Clapper rails have been recorded in the fringe marsh at the HWRP site.

Western Snowy Plover. The coastal population of western snowy plover (*Charadrius alexandrinus*) is federally threatened and a California species of special concern. This species inhabits coastal sandy beaches and tidal flats. Small numbers of snowy plovers have been found nesting on North Bay salt ponds (in Napa County) and have been seen foraging in diked seasonal wetlands. The majority of local snowy plovers nest in the South Bay on abandoned salt ponds.

California Least Tern. The California least tern (*Sterna antillarum browni*) is listed as endangered under both the state and federal ESA. This small seabird migrates north to southern and central California in May to breed (Massey 1974), nesting in coastal areas adjacent to shallow marine and estuarine habitats, where they can forage on fish at the water surface. They begin laying their eggs in May, chicks start hatching by June, and they begin maturing into fledglings by early July (MEC Analytical Systems 1988; Keane, 1987). The terns generally depart for their wintering grounds in August (Massey and Atwood 1981).

In the Bay Area, only a few locations have been used successfully by nesting least terns, the most important being the former NAS Alameda. No nesting California least terns have been reported in San Pablo Bay in the CNDDB, although it is possible that terns may forage there and perhaps nest at undisclosed locations. California least terns have been documented foraging in eelgrass beds in the central Bay, and thus there may be a potential for foraging to occur in the large eelgrass bed between Point Pinole and Point San Pablo.

Saltmarsh Common Yellowthroat. The salt marsh common yellowthroat (*Geothlypis trichas sinuosa*) is a California species of special concern. This species is associated with saltwater marshes of the San Francisco Bay Area. Its exact breeding range has not been completely delineated (Marshall and Dedrick 1994). It is thought that it relies on freshwater or brackish marshes during the breeding season and moves to saltwater marshes during the winter (Foster 1977).

The salt marsh common yellowthroat typically occupies thick vegetation in a wide range of habitats from wetlands to prairie (Foster 1977), and sometimes even in pine forest (Guzy and Ritchison 1999). Low, thick vegetation dominated by willow and dense undergrowth of herbaceous plants is typical, sometimes with thick stands of cattail. In the San Francisco Bay Area the species is generally thought to be non-migratory.

San Pablo Song Sparrow. The San Pablo song sparrow (*Melospiza melodia samuelis*) is a California species of concern. This sparrow is presently distributed in marshes around San Pablo Bay continuously from Gallinas Creek in the west, along the northern San Pablo Bayshore, and throughout the extensive marshes along the Petaluma, Sonoma, and Napa rivers. San Pablo song sparrows inhabit salt and brackish vegetation and can occur in high concentrations in optimal habitat (CDFG 1974).

The species may have previously been more widespread between Richardson and San Rafael Bays, but only small populations remain in isolated marshes at the western edge of Richardson Bay. Along the southeast shoreline of San Pablo Bay, isolated populations occur in small marshes between Wilson Point and Pinole Point, and at the mouths of San Pablo Creek and Wildcat Creek (CDFG 1974).

Salt Marsh Harvest Mouse. The salt marsh harvest mouse (*Reithrodontomys raviventris*) is both state and federally endangered as well as a fully protected species by the state. They are critically dependent on large contiguous areas of salt marsh with dense cover, preferring habitat dominated by pickleweed (*Salicornia virginica*). These mice may also move into the adjoining grasslands during the highest winter tides, though they are reportedly excellent swimmers. Studies have shown that the best pickleweed habitat for salt marsh harvest mice has 100% cover, with plant heights from 1–2 feet (30–60 cm) during the peak growing season (USFWS 1984). Two recognized subspecies, northern and southern salt marsh harvest mice, are found around the San Francisco, San Pablo, and Suisun Bays. Salt marsh harvest mice have been reported in the fringe marsh at the HWRP site.

Northern Harrier. The northern harrier (*Circus cyaneus*) is a California species of concern. It is found in grasslands, meadows, marshes, and seasonal and agricultural wetlands providing tall cover. Harriers are frequently observed at the HWRP site; several active nesting sites were observed at the HWRP site in 2007.

Western burrowing owl. The western burrowing owl (*Athene cunicularia hypugea*) is a California species of concern. It utilizes rodent burrows in sparse grassland, desert, and agricultural habitats. Burrowing owls were observed at the HWRP site in recent years including 2008.

Salt marsh wandering shrew. The salt marsh wandering shrew (*Sorex vagrans halicoetes*) is a California species of concern. It occupies mid-elevation salt marsh habitats with dense growths of pickleweed and requires driftwood and other objects for nesting cover. This species may be present in salt marsh habitats at the HWRP site.

White-tailed kite. The white-tailed kite (*Elanus leucurus*) is a California fully-protected species that occupies low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging. This species has been observed frequently at the HWRP site and could potentially nest on the site.

Other Protected Species. Several species of migratory birds have the potential to forage within, migrate through, or nest in terrestrial habitats near the dredged material delivery points and in the upland habitat that will be removed by excavation of the BMKV basin under Alternative 4. Although these species are not considered special-status wildlife species, they are protected by CDFG Code Sections 3503 and 3503.5 and the Migratory Bird Treaty Act (MBTA) (50 CFR 10 and 21), as are their occupied nests and eggs.

Plant Species

Special Status Plant Species

California Seablite (*Suaeda californica*)—This species is on the CNPS List 1B, and is federally listed as endangered. It is an evergreen shrub in the Chenopodiaceae (Goosefoot) family which blooms from July to October and occurs on the margins of tidal salt marsh. It occurred historically in the Bay Area in Alameda, Contra Costa, and Santa Clara Counties, but has likely been extirpated from this area. It is restricted today to Morro Bay in San Luis Obispo County.

Hairless popcorn-flower (*Plagiobothrys glaber*)—This species is on the CNPS List 1A, and is not federally or state listed. It is an annual herb in the Boraginaceae (Borage) family that blooms from April to May and occurs in tidal salt marshes and swamps. It was present historically in the Bay Area in Marin, Alameda, Santa Clara, and San Benito Counties, and was thought to have gone extinct until 2002 when it was discovered in Dublin (CNDDB, 2007).

Pappose tarplant (*Centromadia parryi* ssp. *parryi*)—This species is on the CNPS's List 1B, but is not federally or state listed. It is an annual herb in the Asteraceae (Sunflower) family that blooms from May to November and occurs in tidal salt marshes and swamps. It has been documented in Northern California in Butte, Colusa, Glenn, and Lake Counties, and in Napa, San Mateo, Solano, and Sonoma Counties in the Bay Area.

Petaluma popcorn flower (*Plagiobothrys mollis* var. *vetitus*)—This species is on the CNPS's List 1A, but is not federally or state listed. It is a perennial herb in the Boraginaceae (Borage) family that blooms from June to July and occurs in tidal salt marshes and swamps. It is known from only one occurrence in Petaluma and is thought to be extinct. Its habitat is wet sites in grasslands and possibly in tidal salt marsh (CNDDB 2007).

Point Reyes bird's beak (*Cordylanthus maritumus* ssp. *palustris*)—This species is on the CNPS List 1B, but is not federally or state listed. It is a hemiparasitic annual herb in the Scrophulariaceae (Figwort) family that blooms from June to October and is endemic to tidal salt marshes. It occurs along coastal northern California from Humboldt to Santa Clara County and may have been extirpated in Alameda, Santa Clara, and San Mateo Counties. It has been observed in marshes near the mouth of Gallinas Creek, just south of the project area.

Soft bird's beak (*Cordylanthus mollis* ssp. *mollis*)—This species is federally listed as endangered, state-listed as rare, and on the CNPS's List 1B. It is a hemiparasitic annual herb in the Scrophulariaceae (Figwort) family that blooms from July to September and occurs in the upper elevations of tidal salt marsh that are regularly inundated but are above areas receiving daily flooding. It occurs in the Bay Area in Suisun Marsh and in Contra Costa, Napa, and Solano Counties. Historically, it also occurred in Marin, Sacramento, and Sonoma Counties. It has been observed at Point Pinole Regional Park.

770 **Table 3.5-1.** Special-Status Marine Mammal and Fish Species that Occur or Have Potential to Occur Near the Proposed ATF or Alternatives

Common and Scientific Name	Legal Status[a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
FISH				
River lamprey (*Lampetra ayresii)*	—/CSC/—	Spawn in fresh water habitats in gravelly riffles; ammocoetes (juveniles) rear in fresh water for 3–5 years before migrating to the ocean (Moyle 2002).	Lower Sacramento and San Joaquin Rivers, Napa River, Sonoma Creek, Alameda Creek, Salmon Creek, Russian River tributaries, and tributaries to San Francisco Bay.	Could occur in the location of the proposed ATF and BMKV basins.
Longfin smelt (*Spirinchus thaleichthys*)	—/CSC/—	Spawns in lower Sacramento-San Joaquin River and Suisun Bay; pre-spawning adults and juveniles inhabit shoal areas of San Pablo Bay.	Lower Sacramento-San Joaquin River, Suisun Bay, and San Pablo Bay.	Could occur in the location of the proposed ATF and BMKV basins.
Steelhead: (*Oncorhynchus mykiss*) Central California Coast Central Valley	 T/CSC/— T/ CSC/—	Spawns in fresh water; juveniles rear in fresh and estuarine water before migrating to the ocean.	Coastal streams in California; critical habitat in San Pablo Bay (70 FR 52571). Central Valley rivers and streams.	Juveniles migrating to the ocean may use these areas to rear; adults migrate through San Pablo Bay to reach freshwater spawning grounds; steelhead known in Novato Creek.
Chinook Salmon: (*Oncorhynchus tshawytscha)* Sacramento winter-run Central Valley spring-run Central Valley fall and late fall-run	 E/E/— T/T/— —/CSC/—	Spawns in fresh water; juveniles rear in fresh and estuarine water before migrating to the ocean.	Central Valley rivers and streams; critical habitat for winter-run Chinook designated in San Pablo Bay (58 FR 33213).	Juveniles migrating to the ocean may use these areas to rear; adults from all ESUs migrate through San Pablo Bay to reach freshwater spawning grounds; San Pablo Bay is within the critical habitat defined for winter-run Chinook salmon; Chinook reported in Arroyo San Jose in 2001.

Common and Scientific Name	Legal Status[a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Green Sturgeon (southern DPS) (*Acipenser medirostris)*	T/CSC/—	Spawns in well-oxygenated, cool, riverine habitat with water temperatures from 8.0 to 14°C; juveniles rear in estuarine waters.	Sacramento, lower Feather, Klamath, and Trinity Rivers (Moyle 2002); southern DPS spawns in the Sacramento River.	Adults migrate through San Pablo Bay on their way to spawning grounds in the Sacramento River juveniles and sub-adults rear in San Pablo Bay
Sacramento splittail (*Pogonichthys macrokepidotus*)	T/CSC/--	Generally restricted to tidal freshwater and low-salinity habitats	Generally upstream of San Pablo Bay	Juvenile splittail would most commonly be found at depths less than 3 to 6 feet (1 to 2 m), in tidal, turbid, brackish and soft-bottomed habitat. Adults, splittails are bottom-oriented rovers that feed on benthic crustaceans whose optimal habitat is in channels of the estuary with significant current from rivers or tide.
Delta Smelt (*Hypomesus transpacificus*)	T/T/—	Inhabit open surface waters where they school. Spawning occurs primarily in sloughs and shallow edge-waters of channels in the upper Delta and in the Sacramento River.	Found primarily in the Delta below Isleton on the Sacramento River and below Mossdale on the San Joaquin River, as well as in Suisun Bay Designated critical habitat for the Delta smelt includes the Delta west to the Carquinez Bridge.	From January to July they move into freshwater for spawning and, during high flows, they can be washed downstream into San Pablo Bay (Ganssle 1966 as cited in Moyle et a1. 1992), but are rarely found in the project area.

Common and Scientific Name	Legal Status[a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
MARINE MAMMALS				
Southern sea otter (*Enhydra lutris nereis*).	—/FP/—	Inhabit shallow coastal areas and prefer places with aquatic vegetation.	Half Moon Bay to Morro Bay.	Does not occur in San Francisco Bay.
Northern elephant seal (*Mirounga angustirostris*)	—/FP/—	During the breeding season, live on beaches on offshore islands. The rest of the year, except for molting periods, off-shore in open ocean	North Pacific, from Baja California, Mexico to the Gulf of Alaska and Aleutian Islands.	Rare stray into San Francisco Bay and San Pablo Bay.
Grey Whale *(Eschrichtius robustus)*	MMPA	Coastlines and large embayments, but spend majority of time in the open ocean.	Migrate along the entire coast of California.	Grey whales are observed infrequently in San Francisco Bay during their migration periods. Most are observed near the Golden Gate, but have on occasion been observed in San Pablo Bay.
Humpback Whale *(Megaptera noveangliae)*	MMPA	Coastlines and large embayments, but spend majority of time in the open ocean.	Along the entire coast of California.	Rare stray into San Francisco Bay and San Pablo Bay.
Harbor porpoise *(Phocoena phocoena)*	MMPA	Coastlines and large embayments.	Along northern and central coast.	Observed infrequently; most observations in San Francisco Bay are primarily in the vicinity of the Golden Gate Bridge.

Common and Scientific Name	Legal Status[a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Harbor seal *(Phoca vitulina richardsi*)	MMPA	Favor near-shore coastal waters and are often seen at sandy beaches, mudflats, bays, and estuaries.	Along entire coast.	Hear-round residents of the San Francisco Bay. Haul-out at several locations in the Bay. Harbor seals use Sisters Rocks (approximately 2,100 yards south of the proposed ATF location) and Castro Rocks, adjacent to the Richmond–San Rafael Bridge, (approximately 7,000 yards southeast) as haul-out sites for resting and breeding. Castro Rocks is the largest haul-out site in the North Bay and the second largest breeding site in the San Francisco Bay. Harbor seals also use Lower Tubbs Island as a haul-out site (approximately 11,000 yards northeast of the proposed ATF location).
California sea lion *(Zalophus californicus)*	MMPA	Open water, isolated shoreline and rocky islands. They breed mainly on offshore islands.	West Coast from Vancouver to the Gulf of California.	California sea lions primarily use the central San Francisco Bay to feed. Shortly after the 1989 Loma Prieta earthquake, they hauled out on PIER 39's K-Dock in San Francisco. Although they are occasionally observed on Castro Rocks, no pupping or regular haul sites are located in San Pablo Bay.
Stellar's sea lion *(Eumetopius jubatus)*	MMPA	Open water, isolated shoreline and rocky Islands	Found from San Mateo County north.	Observed infrequently; and most observations in San Francisco Bay are primarily in the vicinity of the Golden Gate Bridge.

Common and Scientific Name	Legal Status[a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area

[a] Status explanations:

Federal

E = listed as endangered under the federal ESA.

T = listed as threatened under the federal ESA.

PD = proposed for federal listing as endangered under the federal ESA.

C = species for which USFWS has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list, but issuance of the proposed rule is precluded.

— = no listing.

MMPA = Protected under the Marine Mammal Protection Act

State

E = listed as endangered under the California ESA.

T = listed as threatened under the California ESA.

FP = fully protected under the California Fish and Game Code.

CSC = species of special concern in California.

— = no listing.

DPS = distinct population segment

ESU = Evolutionary Significant Unit

Source: Unless otherwise indicated, all survey results are taken from USACE 1996.

Table 3.5-2. Special-Status Wildlife and Plant Species that Occur or Have Potential to Occur Near the Proposed ATF or Alternatives

Common and Scientific Name	Legal Status [a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
PLANTS				
California seablite (Suaeda californica)	E/—/1B	Margins of tidal salt marsh, below 50 ft; blooms Jul–Oct	Likely extirpated from San Francisco Bay area; known only from Morro Bay	Only occurrence in Baylands likely extirpated. No tidal salt marsh removed by alternatives.
Hairless popcorn-flower (Plagiobothrys glaber)	—/—1B	Alkaline meadows, tidal salt marsh, 50–590 ft (15–180m); blooms Apr–May	Historically in coastal valleys from Marin County to San Benito Counties	No tidal salt marsh removed by alternatives.
Pappose tarplant (Centromadia parryi ssp. parryi)	—/—/1A	Coastal prairie, meadows and seeps, marshes and swamps (tidal salt), valley and foothill grassland, often alkaline, (to 420m) up to 1,400 ft; blooms May–Nov	Butte, Colusa, Glenn, Lake, Napa, San Mateo, Solano, and Sonoma Counties	Closest occurrence not in Baylands region. No tidal salt marsh removed by alternatives.
Petaluma popcornflower (Plagiobothrys mollis var. vetitus)	—/—/1A	Habitat requirements uncertain; possibly tidal salt marsh or mesic grasslands; blooms June–July	Known only from type specimen in 1988 near Petaluma	Likely extirpated. No tidal salt marsh or mesic grasslands removed by alternatives.
Point Reyes bird's-beak (Cordylanthus maritimus ssp. palustris)	—/—1B	Tidal salt marshes and swamps, sea level up to 30 ft; blooms June–Oct	Northern California coastal counties: Alameda[b], Humboldt, Marin, Santa Clara[b], San Mateo[b], Sonoma; Oregon	Occurrence at mouth of Gallinas Creek, may occur elsewhere. No tidal salt marsh removed by alternatives.
Soft bird's-beak (Cordylanthus mollis ssp. mollis)	E/R/1B	Upper marsh elevations that are regularly inundated but above area receiving daily flooding; blooms July–Sept	San Francisco Bay Region; Suisun Marsh, Contra Costa, Marin[b], Napa, Solano, Sacramento[b], and Sonoma[b] Counties	Two occurrences in Point Pinole Regional Park, may occur elsewhere. No tidal salt marsh removed by alternatives.

Common and Scientific Name	Legal Status [a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
INVERTEBRATES				
Conservancy fairy shrimp (Branchinecta conservation)	E/—/—	Large, deep vernal pools in annual grasslands	Disjunct occurrences in Solano, Merced, Tehama, Ventura, Butte, and Glenn Counties	No suitable habitat present; outside of species' known range
Vernal pool fairy shrimp (Branchinecta lynchi)	T/—/—	Common in vernal pools; also found in sandstone rock outcrop pools	Central Valley, central and south Coast Ranges from Tehama County to Santa Barbara County; isolated populations also in Riverside County	No suitable habitat present; outside of species' known range
California freshwater shrimp (Syncaris pacifica)	E/E/—	Occurs in coastal streams	Coastal northern California	No suitable stream habitat present
San Bruno elfin butterfly (Callophrys mossii bayensis)	E/—/—	North-facing slopes and ridges facing Pacific Ocean from 600 to 1,100 feet	San Bruno Mountain, Montara Mountains, and northern end of Santa Cruz Mountains, San Mateo County	No suitable habitat present; outside of species' known range
Callippe silverspot butterfly (Speyeria callippe callippe)	E/—/—	Open hillsides where wild pansy (Viola pendunculata) grows; larvae feed on Johnny jump-up plants, whereas adults feed on native mints and non-native thistles	San Bruno Mountain, San Mateo County, and a single location in Alameda County	No suitable habitat present; outside of species' known range
Myrtle's silverspot butterfly (Speyeria zerene myrtleae)	E/—/—	Inhabits coastal terrace prairie, coastal bluff scrub, and associated non-native grassland habitats where the larval food plant, Viola sp. occurs	Historically known from San Mateo County north to the mouth of the Russian River in Sonoma County; no butterflies have been observed recently at the known population sites near Pacifica and San Mateo in San Mateo County	No suitable habitat present; outside of species' known range

Common and Scientific Name	Legal Status [a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
AMPHIBIANS				
California red-legged frog (Rana aurora draytonii)	T/CSC/—	Permanent and semi-permanent aquatic habitats, such as creeks and coldwater ponds, with emergent and submergent vegetation and riparian species along the edges; may estivate in rodent burrows or cracks during dry periods	Found along the coast and coastal mountain ranges of California from Shasta County to San Diego County; Sierra Nevada from Butte County to Fresno County	No records from surveys conducted in the Hamilton Army Airfield (HAAF) or BMKV (Environmental Science Associates 1993) area; no suitable freshwater habitat; not expected to occur in the project area
Foothill yellow-legged frog (Rana boylii)	—/SCC/—	Creeks or rivers in woodlands or forests with rock and gravel substrate and low overhanging vegetation along the edge; usually found near riffles with rocks and sunny banks nearby	Occurs in the Klamath, Cascade, north Coast, south Coast, and Transverse Ranges; through the Sierra Nevada foothills up to approximately 6,000 ft (1,800 m) south to Kern County	No suitable habitat present near project area; outside species' known range
REPTILES				
Northwestern pond turtle (Clemmys marmorata marnorata)	—/SCC/—	Woodlands, grasslands, and open forests; occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation	In California, range extends from Oregon border of Del Norte and Siskiyou Counties south along the coast to San Francisco Bay, inland through Sacramento Valley, and on the western slope of Sierra Nevada; range overlaps with that of southwestern pond turtle through the Delta and Central Valley to Tulare County	No suitable habitat in project area

Common and Scientific Name	Legal Status [a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Southwestern pond turtle (Clemmys marmorata pallida)	—/SCC/—	Woodlands, grasslands, and open forests; occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation	Occurs along the Central Coast of California east to the Sierra Nevada and along the southern California coast inland to the Mojave and Sonora Deserts; range overlaps with that of the northwestern pond turtle throughout the Delta and in the Central Valley from Sacramento County to Tulare County	No suitable habitat in project area
Alameda whipsnake (Masticophis lateralis euryxanthus)	T/T/—	Valleys, foothills, and low mountains associated with northern coastal scrub or chaparral habitat; requires rock outcrops for cover and foraging	Restricted to Alameda and Contra Costa Counties; fragmented into five disjunct populations throughout its range	No suitable habitat present; outside of species' known range
BIRDS				
California brown pelican (Pelecanus occidentalis californicus)	E/E, FP/—	Nests on coastal cliffs; forages in deep water	Coastal California	Observed foraging in San Pablo Bay most of the year, especially during summer; utilizes open water habitat; no suitable nesting habitat in project area

Common and Scientific Name	Legal Status [a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Double-crested cormorant (Phalacrocorax auritus)	—/CSC/—	Winters along the entire California coast and inland over the Coast Ranges into the Central Valley from Tehama County to Fresno County; a permanent resident along the coast from Monterey County to San Diego County, along the Colorado River, Imperial, Riverside, Kern, and King Counties, and the islands off San Francisco; breeds in Siskiyou, Modoc, Lassen, Shasta, Plumas, and Mono Counties; also breeds in the San Francisco Bay area and in Yolo and Sacramento Counties	Rocky coastlines, beaches, inland ponds, and lakes; needs open water for foraging, and nests in riparian forests or on protected islands, usually in snags	Observed just outside the tidal salt marsh, in the wider channels in the marsh at HAAF, and in open water habitat in San Pablo Bay; no suitable nesting habitat in project area
Cooper's Hawk (Acciptier cooperi)	—/CSC/—	Nests in a wide variety of habitat types, from riparian woodlands and digger pine-oak woodlands through mixed conifer forests	Throughout California except high altitudes in the Sierra Nevada; winters in the Central Valley, southeastern desert regions, and plains east of the Cascade Range	Recorded occasionally on HAAF site; no nesting habitat on HAAF site observed
Swainson's hawk (Buteo swainsoni)	—/T/—	Nests in oaks or cottonwoods in or near riparian habitats; forages in grasslands, irrigated pastures, and grain fields	Lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley; highest nesting densities occur near Davis and Woodland, Yolo County	No suitable nesting habitat; rarely observed around San Pablo Bay
Ferruginous hawk (Buteo regalis)	—/CSC/—	Open terrain in plains and foothills where ground squirrels and other prey are available	Does not nest in California; winter visitor along the coast from Sonoma County to San Diego County, eastward to the Sierra Nevada foothills and southeastern deserts, the Inyo-White Mountains, the plains east of the Cascade Range, and Siskiyou County	Rarely observed foraging near San Pablo Bay in winter; does not nest in California

Common and Scientific Name	Legal Status [a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Sharp-Shinned Hawk (Accipiter striatus)	—/CSC/—	Dense canopy ponderosa pine or mixed-conifer forest and riparian habitats	Permanent resident in the Sierra Nevada, Cascade, Klamath, and north Coast Ranges at mid elevations and along the coast in Marin, San Francisco, San Mateo, Santa Cruz, and Monterey Counties; winters over the rest of the state except at very high elevations	Recorded occasionally on HAAF site; no nesting habitat found on HAAF.
Northern Harrier (Circus cyaneus)	—/CSC/—	Grasslands, meadows, marshes, and seasonal and agricultural wetlands providing tall cover	Throughout lowland California; has been recorded in migration at high elevations	Common on HAAF site with 10 seen foraging in fields on January 30, 2002; observed nesting on HWRP site in 2007.
White-tailed kite (Elanus leucurus)	—/FP/—	Low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging	Lowland areas west of Sierra Nevada from head of Sacramento Valley south, including coastal valleys and foothills to western San Diego County at the Mexico border	Common with eight seen foraging in fields on January 30, 2002; nesting not documented yet but probably nests within the restoration area; suitable foraging habitat occurs in grassland, agricultural, and marsh habitats
Golden eagle (Aquila chrysaetos)	—/CSC, FP/—	Nest on cliffs and escarpments or in tall trees overlooking open country; forages in annual grasslands, chaparral, and oak woodlands with plentiful medium- and large-sized mammals	Foothills and mountains throughout California; uncommon nonbreeding visitor to lowlands such as the Central Valley	Occasionally forages in grassland areas near San Pablo Bay. Observed roosting at HAAF in 2005.

Common and Scientific Name	Legal Status [a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Osprey (Pandion haliaetus)	—/CSC/—	Nests in snags, trees, or utility poles near the ocean, large lakes, or rivers with abundant fish populations	Nests along the north coast from Marin County to Del Norte County, east through the Klamath and Cascade Ranges, and in the upper Sacramento Valley; important inland breeding populations at Shasta Lake, Eagle Lake, and Lake Almanor and small numbers elsewhere south through the Sierra Nevada; winters along the coast from San Mateo County to San Diego County	Common on HWRP and in San Pablo Bay.
Bald eagle (Haliaeetus leucocephalus)	--/E, FP/—	In western North America, nests and roosts in coniferous forests and woodlands within 1 mile of a lake, a reservoir, a stream, or the ocean	Nests in Siskiyou, Modoc, Trinity, Shasta, Lassen, Plumas, Butte, Tehama, Lake, and Mendocino Counties and in the Lake Tahoe Basin; reintroduced into the Central Coast area; winter range includes the rest of California, except the southeastern deserts, very high altitudes in the Sierras, and east of the Sierra Nevada south of Mono County; range expanding into the western Sierra Nevada foothills	Potential occasional forager on HAAF; no suitable nesting habitat in the project area; not a known wintering area
American peregrine falcon (Falco preregrinus anatum)	E/E, FP/—	Nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes that support large populations of other bird species	Permanent resident of the north and south Coast Ranges; may summer on the Cascade and Klamath Ranges south through the Sierra Nevada to Madera County; winters in the Central Valley south through the Transverse and Peninsular Ranges and the plains east of the Cascade Range	No suitable nesting habitat; occasional visitor; recorded foraging on HAAF in 1997. Nest nearby and forage at site regularly.

Common and Scientific Name	Legal Status [a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
California black rail (Laterallus jamaicensis coturniculus)	—/T, FP/—	Tidal salt marshes associated with heavy growth of pickleweed; also occurs in brackish marshes or freshwater marshes at low elevations	Permanent resident in the San Francisco Bay and east-ward through the Delta into Sacramento and San Joaquin Counties; small populations in Marin, Santa Cruz, San Luis Obispo, Orange, Riverside, and Imperial Counties	The tidal marsh provides high-quality nesting and foraging habitat; observed in the tidal salt marsh at HAAF; known in Novato Creek marshes
California clapper rail (Rallus longirostris obsoletus)	E/E, FP/—	Restricted to salt marshes and tidal sloughs; usually associated with heavy growth of pickleweed; feeds on mollusks removed from mud in sloughs	Marshes around San Francisco Bay and east through the Delta to Suisun Marsh	Tidal marsh provides high-quality nesting and foraging habitat; has been observed in tidal salt marsh at HAAF; known in Novato Creek marsh
Western snowy plover (coastal population) (Charadrius alexandrinus nivosus)	T/SCC/—	Nests on open, flat beaches and alkali flats; forages on beaches and mudflats	Coastal California including the San Francisco Bay Area	No suitable nesting habitat; no records near project area; could forage in seasonal wetlands and mudflats in the project area during winter months
California least tern (Sterna antillarum browni)	E/E, FP/—	Nests on sandy, upper ocean beaches, and occasionally uses mudflats; forages on adjacent surf line, estuaries, or the open ocean	Nests on beaches along the San Francisco Bay and Delta and along the southern California coast from southern San Luis Obispo County south to San Diego County	No records; no suitable nesting habitat; could forage in shallow water beyond the tidal salt marsh
Marbled murrelet (Brachyramphus marmoratus)	T/E/—	Mature, coastal coniferous forests for nesting; nearby coastal water for foraging; nests in conifer stands older than 150 years and may be found as far as 35 miles inland; winters on subtidal and pelagic waters, often well offshore	Nesting sites from the Oregon border to Eureka and between Santa Cruz and Half Moon Bay; winters in nearshore and offshore waters along the entire California coastline	Outside of species' range (uses coastal habitat)

Common and Scientific Name	Legal Status [a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Short-eared owl (Asio flammeus)	—/CSC/—	Nests and forages in grasslands and marsh habitats	Throughout lowland California	One observed on January 30, 2002; tidal salt marsh and fields on restoration sites are suitable nesting and foraging habitat; recorded on HAAF site in 1997
Western burrowing owl (Athene cunicularia hypugea)	—/CSC/—	Rodent burrows in sparse grassland, desert, and agricultural habitats	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas; rare along south coast	Can be a winter visitor, irregular visitor, or resident. Observed at HWRP site in 2007; likely present at BMKV site.
Northern spotted owl (Strix occidentalis caurina)	T/CSC/—	Dense old-growth or mature forests dominated by conifers with topped trees or oaks available for nesting crevices	A permanent resident throughout its range; found in the north Coast, Klamath, and western Cascade Range from Del Norte County to Marin County	Outside species' range; no suitable habitat present
Saltmarsh common yellowthroat (Geothlypis trichas sinuosa)	—/CSC/—	Freshwater marshes in summer and salt or brackish marshes in fall and winter; requires tall grasses, tules, and willow thickets for nesting and cover	Found only in the San Francisco Bay area in Marin, Napa, Sonoma, Solano, San Francisco, San Mateo, Santa Clara, and Alameda Counties	Suitable habitat occurs in tidal marshes in the project area; observed at the project area in coastal salt marsh; previously observed in or near confluence of Arroyo San Jose and Pacheco Creek

Common and Scientific Name	Legal Status [a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Tricolored blackbird (Agelaius tricolor)	—/CSC/—	Nests in dense colonies in emergent marsh vegetation, such as tules and cattails, or upland sites with blackberries, nettles, thistles, and grain fields; habitat must be large enough to support 50 pairs; probably requires water at or near the nesting colony	Permanent resident in the Central Valley from Butte County to Kern County; breeds at scattered coastal locations from Marin County south to San Diego County and at scattered locations in Lake, Sonoma, and Solano Counties; rare nester in Siskiyou, Modoc, and Lassen Counties	No suitable nesting or foraging habitat present in project area
Alameda (South Bay) song sparrow (Melospiza melodia pusillula)	—/CSC/—	Brackish marshes associated with pickleweed; may nest in tall vegetation or among the pickleweed	Found only in marshes along the southern portion of the San Francisco Bay	Outside of species' range
San Pablo song sparrow (Melospiza melodia samuelis)	—/SCC/—	Brackish and tidal marshes supporting cattails, tules, various sedges, pickleweed, and riparian scrub	Restricted to San Pablo Bay area	Suitable tidal marsh habitat occurs in the project area; observed in tidal salt marsh habitat during 1994, 1997, and 2002
MAMMALS				
Suisun ornate shrew (Sorex ornatus sinuosus)	—/CSC/—	Tidal, salt, and brackish marshes containing pickleweed, grindelia, bulrushes, or cattails; requires driftwood or other objects for nesting cover	Restricted to San Pablo Bay and Suisun Bay, both in Solano County	No records; not likely to occur in the project area
Salt marsh vagrant (wandering) shrew (Sorex vagrans halicoetes)	—/CSC/—	Mid-elevation salt marsh habitats with dense growths of pickleweed; requires driftwood and other objects for nesting cover	Restricted to southern and northwestern San Francisco Bay	May be present in or near restoration areas.

Common and Scientific Name	Legal Status [a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Pacific Townsend's (=western) big-eared bat (Corynorhinus townsendii townsendii)	—/CSC/—	Roosts in caves, tunnels, mines, and dark attics of abandoned buildings; very sensitive to disturbances and may abandon a roost after onsite visit	Coastal regions from Del Norte County south to Santa Barbara County	No records; suitable roosting sites exist in the project area, but no presence of species found on BMKV site
Pallid bat (Antrozous pallidus)	—/CSC/—	Occurs in a variety of habitats from desert to coniferous forest; most closely associated with oak, yellow pine, redwood, and giant sequoia habitats in northern California and oak woodland, grassland, and desert scrub in southern California; relies heavily on trees for roosts	Occurs throughout California except the high Sierra from Shasta to Kern County and the northwest coast, primarily at lower and mid elevations	Suitable habitat not available within project area
Big free-tailed bat [Nyctinomops macrotis (=Tadarida m., T. molossa)]	—/CSC/—	Inhabits arid, rocky areas; roosts in crevices in cliffs	Distribution in California is uncertain because occurrences are very rare; most likely to be found in southern California, but has been recorded in Berkeley, Alameda County	Suitable habitat not available within project area
San Pablo California vole (Microtus californicus sanpabloensis)	—/CSC/—	Restricted to salt marsh habitats	Known only in San Pablo Creek, near San Pablo Bay, Contra Costa County	May be present in or near restoration areas, but not within project area
Saltmarsh harvest mouse (Reithrodontomys raviventris)	E/E, FP/—	Brackish and salt marshes; primarily associated with pickleweed	San Francisco, San Pablo, and Suisun Bays; westernmost portion of the Delta	Suitable habitat exists along the tidal salt marshes in the restoration sites; assumed to occur in pickleweed dominated salt marsh. No tidal salt marsh removed by the alternatives.

Common and Scientific Name	Legal Status [a] Federal/State/ CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
American badger (Taxidea taxus)	—/CSC/—	Requires sufficient food, friable soils, and relatively open uncultivated ground; preferred habitat includes grasslands, savannas, and mountain meadows near timberline	Throughout California, except for the humid coastal forests of northwestern California in Del Norte and the northwestern Humboldt Counties	Suitable habitat not present in project area

a Status explanations:

Federal

E = listed as endangered under the federal ESA.

T = listed as threatened under the federal ESA.

PD = proposed for federal listing as endangered under the federal ESA.

C = species for which USFWS has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list, but issuance of the proposed rule is precluded.

— = no listing.

State

E = listed as endangered under the California ESA.

T = listed as threatened under the California ESA.

R = listed as rare under the California Native Plant Protection Act. This category is no longer used for newly listed plants, but some plants previously listed as rare retain this designation.

FP = fully protected under the California Fish and Game Code.

CSC = species of special concern in California.

— = no listing.

California Native Plant Society

1A = List 1A species: presumed extinct in California.

1B = List 1B species: rare, threatened, or endangered in California and elsewhere.

2 = List 2 species: rare, threatened, or endangered in California but more common elsewhere.

3 = List 3 species: plants about which more information is needed to determine their status.

— = no listing.

b Indicates that a species was extirpated from this region

ft = feet

m = meters

Source: Unless otherwise indicated, all survey results are taken from USACE 1996.

Section 3.6

Environmental Justice, Population, and Housing

3.6.1 Existing Conditions

The proposed project ATF is located in the open waters of San Pablo Bay. There are no permanent residents or houses located in the project area, and there are no federal, regional, or local regulatory policies regarding housing or population relevant to waters of San Pablo Bay. Therefore, this chapter will focus on the existing conditions of the communities found along the shoreline of San Pablo Bay.

Existing conditions information was compiled by reviewing relevant information sources, including, the U.S. Census website and 2000 Census data, and the report on Chemicals in Fish, prepared by The California Environmental Protection Agency (Cal/EPA) (2001).

3.6.1.1 Regional Conditions

Tables 3.6-1 through 3.6-3 provide population, economic, and demographic information by county and community. Four counties share jurisdiction of San Pablo Bay: Marin, Sonoma, Solano, and Contra Costa. Nine communities from three of the jurisdictional counties exist along the shores of San Pablo Bay, as listed in Table 3.6-1 below.

According to the 2005 U.S. Census Bureau estimates, the population of the nine communities comprising San Pablo Bay's shoreline is 383,000, representing 17.8% of the total population residing in the four adjacent counties.

The 2000 U.S. Census data show that approximately 59.2% of the population in San Pablo Bay coastline communities consists of minority individuals (255,919). One of the nine communities—Richmond (Contra Costa County)—is considered low-income.

Table 3.6-1. Population Data for San Pablo Bay Shoreline Communities

Area	2005 Population Estimate	Percent of County Population
Counties		
Contra Costa	1,024,300	100
Marin	248,700	100
Solano	411,700	100
Sonoma	466,900	100
Cities (County)		
Hercules (CC)	24,100	2.0
Novato (M)	50,300	20.0
Pinole (CC)	19,100	2.0
Richmond (CC)	102,200	10.0
San Rafael (M)	55,700	22.0
Vallejo (So)	117,500	29.0
Census Designated Places (County)		
Black Point-Green Point (M)	1,100	0.4
Rodeo (CC)	8,700	0.8
Santa Venetia (M)	4,300	1.7

County Abbreviations:

CC—Contra Costa County; M—Marin County; So—Solano County; Sa—Sonoma County

Source: U.S. Census, 2007.

As shown in Table 3.6-2, five of the nine communities situated along San Pablo Bay's shoreline have minority populations that are greater than 50%. Table 3.6-3 shows that the median income for six of the communities is less than the countywide median, with the City of Richmond having the lowest percentage of income relative to its county. As such, the information derived from the data collected shows that several communities in the proposed action are minority and/or low-income. These communities may potentially be affected by environmental justice concerns.

Table 3.6-2. Community Population Demographics (Percent) for San Pablo Bay Shoreline Communities

Area	White	Black or African American	American Indian or Alaska Native	Asian	Native Hawaiian / Pacific Islander	Other Race	Two or More Races	Hispanic or Latino of Any Race
Counties								
Contra Costa	57.9	9.2	0.4	10.8	0.3	0.3	3.4	17.7
Marin	78.6	2.8	0.3	4.5	0.1	0.3	2.4	11.1
Solano	49.2	14.6	0.6	12.5	0.7	0.2	4.5	17.6
Sonoma	74.5	1.3	0.8	3.0	0.2	0.2	2.7	17.3
Cities (County)								
Hercules (CC)	23.7	18.3	0.1	42.4	0.5	0.2	3.9	10.8
Novato (M)	76.3	1.9	0.2	5.1	0.1	0.3	2.9	13.1
Pinole (CC)	48.4	10.9	0.4	21.5	0.3	0.3	4.4	13.8
Richmond (CC)	21.2	35.6	0.4	12.2	0.5	0.4	3.3	26.5
San Rafael (M)	65.9	2.1	0.2	5.5	0.1	0.3	2.5	23.3
Vallejo (So)	30.4	23.3	0.5	23.8	1.0	0.3	4.8	15.9
Census Designated Places (County)								
Black Point-Green Point (M)	89.5	0.5	0.2	2.2	0.9	0.4	1.9	4.4
Rodeo (CC)	45.2	15.9	0.6	15.9	0.5	0.3	4.6	17.1
Santa Venetia (M)	75.8	2.1	0.5	0.6	0.2	0.3	3.2	12.1

County Abbreviations:
CC—Contra Costa County; M—Marin County; So—Solano County; Sa—Sonoma County
Source U.S. Census, 2000

Table 3.6-3. Community Economic Demographics for San Pablo Bay Shoreline Communities

Area	Median Household Income (1999 Dollars)	Percentage of County Household Income
Counties		
Contra Costa	63,675	--
Marin	71,306	--
Solano	60,597	--
Sonoma	53,076	--
Cities (County)		
Hercules (CC)	75,196	118
Novato (M)	63,453	89
Pinole (CC)	62,256	98
Richmond (CC)	44,210	69
San Rafael (M)	60,994	86
Vallejo (S)	50,030	83
Census Designated Places		
Black Point-Green Point (M)	92,729	130
Rodeo (CC)	60,522	95
Santa Venetia (M)	75,600	106

County Abbreviations:
CC—Contra Costa County; M—Marin County; So—Solano County; Sa—Sonoma County
Source: U.S. Census 2000

3.6.1.2 Subsistence Fishing

Cal/EPA considers "subsistence fishers" to be people who rely on non-commercial fish as a major source of protein. Cal/EPA suggests that subsistence fishers tend to consume non-commercial fish and/or shellfish at higher rates than other fishing populations, and for a greater percentage of the year, due to cultural and/or economic factors (Cal/EPA 2001).

The general concept of a subsistence fisher lumps together ethnically diverse peoples with different fishing access, preferences, and success on potentially different water bodies (and commonly excludes Caucasian, middle-income, or upper-income consumers with high rates of consumption who are thus also potentially at risk). Cal/EPA suggests that Native American and lower income urban, rural, and Asian-American populations often include subsistence fishers, and describes some of the difficulties in characterizing these subpopulations in general, and subsistence fishers, in particular. For example, subsistence fishers may not have registered for fishing licenses for a variety of reasons and thus are likely to be underrepresented in surveys based on fishing licenses. (Cal/EPA 2001)

Various minority populations, low-income communities, and tribes in California depend on aquatic life as an important component of their diets. Fish and invertebrates are collected from San Francisco

Bay for commercial, recreational, and subsistence purposes. Sturgeon, striped bass, and perch are popular catches of the San Francisco and San Pablo Bays.

3.6.1.3 Site-Specific Conditions

There are no residential housing units or identifiable population groups located within the waters of San Pablo Bay. However, San Pablo Bay is home to numerous species of marine life, including those used for general consumption. Sturgeon, striped bass, halibut, white croaker, and perch are popular catches of San Pablo Bay. The sturgeon triangle, a popular area renowned for sturgeon and bass fishing, is located in San Pablo Bay and partially in the project area (see Figure 3.9-1). In addition, there are several public recreational piers located at Point Pinole Regional Park, McNears County Beach, and China Camp State Park. Through this availability of a local food source, San Pablo Bay represents an important resource to low-income and minority communities.

Responding to health concerns regarding high levels of mercury, PCBs, and other chemicals in fish from San Francisco Bay, the Office of Environmental Health Hazard Assessment (OEHHA) issued a public health advisory for the consumption of fish. This health advisory has been in effect since 1994, and sets recommended consumption limits and preparation methods for fish caught from San Francisco Bay.

Section 3.7
Cultural Resources

3.7.1 Existing Conditions

Cultural resources are defined as buildings, sites, structure, or objects, each of which may have historic, architectural, archaeological, cultural, or scientific importance. Numerous laws, regulations, statutes, on both the federal and state levels, protect and target the management of cultural resources. Depending on the variety of preconditions such as inclusion of federal monies, or significant effects on wetlands, federal or state law may be the primary governing code. The identification of existing cultural resources in the project area was conducted in accordance with Section 106 of the National Historic Preservation Act of 1966 (NHPA) and its implementing regulations (36 CFR Part 800). Section 106 requires that federal agencies, and entities that they fund or license, consider the effect of their actions on properties that are listed in the National Register of Historic Places (NRHP), or that may be eligible for such listing. All resources listed in or formally determined eligible for the NRHP are also eligible for the California Register of Historical Resources (CRHR). The California Register is a listing of State of California resources that are significant within the context of California's history. The California Register is a state-wide program of similar scope to the NRHP; however resources may be eligible for the CRHR for state-level importance and not eligible for the NRHP.

Existing conditions information was compiled by reviewing relevant technical reports, conducting a literature review and records search, researching historic maps, reviewing the California State Lands Commission database of shipwrecks, and consulting with Native Americans. This section considers the conditions under which NRHP- and/or CRHR-eligible resources may exist within the project Area of Potential Effects (APE).

3.7.1.1 Area of Potential Effects

The APE is the total area that could be disturbed due to construction, operation, and maintenance activities under the proposed action and alternatives. The APE is a preliminary delineation and is subject to review by the State Historic Preservation Officer (SHPO). The APE for each alternative is described in Chapter 2, *Description of Alternatives*, including detail in Table 2-3. A summary of the APE for each alternative (both horizontally and vertically) is as follows:

- **Alternative 1: Dredged Material Off-Loader Facility (No Action)** – The APE is shown on Figure 1-2 and includes: the area of existing authorized off-loader and booster pumps (consisting of 2.3 ac from the surface to the depth of piles); and the delivery pipeline alignment (2.2 ac including surface and immediate subsurface only).

- **Alternative 2: Unconfined In-Bay ATF (Proposed Action)** – The APE is shown on Figure 1-2 and includes: the area of potential location of the ATF and the access channel shown as a blue circle on Figure 1-2; the actual extent of the ATF (consisting of 44 ac to a depth of -60 feet MLLW) which is within the blue circle; the actual extent of the access channel (consisting of 17 ac to a depth of -32 feet MLLW) which is within the blue circle; and the delivery pipeline (consisting of 2.2 ac including surface and immediate subsurface only).
- **Alternative 3: Confined In-Bay ATF** – The APE is shown on Figure 1-2 and includes: the area of potential location of the ATF shown as a blue circle on Figure 1-2; the actual extent of the ATF (consisting of 44 ac to a depth of -60 feet MLLW) which is within the blue circle; and the delivery pipeline (consisting of 2.2 ac including surface and immediate subsurface only).
- **Alternative 4: Direct Channel to BMKV Basin** – The APE is shown on Figure 2-7 and includes the direct channel (consisting of 243 ac to a depth of -17 feet MLLW); the BMKV basin (consisting of 44 ac to a depth of -32.5 feet MLLW); and the temporary basin levees (consisting of an area of 16 ac on the surface and immediate subsurface only).

3.7.1.1 Regional Conditions

Previous Archaeological Research in San Francisco Bay Area

Archaeological investigations in the San Francisco Bay Area were initiated under the auspices of the University of California, Berkeley, Anthropology Department in 1902, when Max Uhle began the first excavation at the Emeryville Shellmound in Alameda County. Nels C. Nelson was the first archaeologist to survey the coastline of San Francisco Bay, including the Marin County coast. Nelson conducted a survey of the Bay Area between 1906 and 1908 during which he documented 425 shellmounds along the coast from the Russian River in Sonoma County to Half Moon Bay in San Mateo County (Nelson, 1909). There are numerous Nelson shellmounds located within a short distance of the proposed project area, to the north and south. Nelson also performed the first investigations at three shellmounds in eastern Marin County in 1909 and 1910. However, archaeology in Marin County and the Bay Area as a whole remained largely unexplored until the 1940s and later.

Results from previous archaeological investigations near the project area and the surrounding region have shown that the San Francisco Bay Area was inhabited by mobile hunter-gatherers. Over time, their foraging strategies became more focused on the locally obtainable resources, and their lives became increasingly more sedentary. Fredrickson and Bennyhoff developed a taxonomic sequence that defined three basic cultural patterns—the Windmiller Pattern, the Berkeley Pattern, and the Augustine Pattern—throughout the San Francisco Bay Area and interior Delta for the period between 2500 B.C. and 1500 A.D. (Bennyhoff and Fredrickson, 1994). The Windmiller Pattern shifted to a more specialized adaptation called the Berkeley Pattern, which spanned approximately 1,000 years, from about 1500 B.C. to 500 B.C. The Augustine Pattern followed the Berkeley Pattern around 500 A.D. This adaptation was adopted by the ethnographically known people of the historic period, the Coast Miwok.

Landforms and geologic processes are known to be significant factors in regulating the distribution of prehistoric populations. At the beginning of the Early Holocene (11,000 before present), there was a dramatic rise in sea level 115 feet (35 m) that flooded large river channels in what is now San Francisco Bay. It is likely that tidal marsh and/or estuary deposits began to form in the southern Bay valleys as the rate of sea-level rise began to decrease during the Middle Holocene (3,600 before present). It is possible that people were forced to relocate themselves from a less stable valley floor at this time and that Early and Middle Holocene-age archaeological materials may now be submerged beneath those portions of San Francisco Bay that once formed the lower valley (Stewart, Meyer, and Newland, 2001).

3.7.1.2 Ethnographic Setting

Ethnography of the Coast Miwok

The project area was inhabited by the Coast Miwok Indians in the prehistoric past and at the time of contact. The Coast Miwok language, a member of the Miwokan subfamily of the Utian family, is divided into two dialect groups: Western (Bodega) and Southern (Kelly 1978:414; Shipley 1978:84). The Coast Miwok territory extended from Duncan's Point on the Sonoma County coast to the end of the Marin County peninsula (Kroeber 1925) and as far east as midway between the Sonoma and Napa Rivers (Kelly 1978). These boundaries are based on common linguistic associations rather than a common sociopolitical organization. Kroeber (1925:831) defined the largest unit of political organization as a tribelet, which encompassed the village community.

The main tribelet in the project area was the Omiomi group, which inhabited the valley of Novato Creek on the northwest side of San Pablo Bay (Milliken 1995:250). Other nearby tribelets included Alaguali, Olompali, Petaluma, Tamal, and several others included within Coast Miwok territory.

Coast Miwok sociopolitical organization did not extend beyond the village. Larger villages had a chief, whose position was nonhereditary. The chief's responsibilities included advising and caring for the villagers and overseeing activities in the dance house (Kelly 1978:419). Coast Miwok villages were usually located near major inland watercourses or, in some cases, along the coast. The Coast Miwok subsistence strategy focused on the coast and the adjacent inland for much of the year, where salmon and other fish, deer, crab, kelp, seeds, mudhens, geese, mussels, and clams were available. During summer, the focus of hunting and plant-gathering activities shifted to the hills, where rabbit, bear, elk, deer, squirrels, gophers, seeds, greens, and acorns were plentiful (Kelly 1978:415–417; Heizer and Elsasser, 1980).

Contact between the Coast Miwok and Europeans first occurred on the Marin County coast as early as 1579, when Sir Francis Drake spent 5 weeks on the coast to repair his damaged ship (Kroeber 1925). Spanish explorers made contact with the Coast Miwok in the late 1700s. The mission of the Spanish colonists was to turn the Native American population into Spaniards, in religion, in language, and gradually, through the intermixing of blood (Bean and Rawls 1993:17). By 1776, the Franciscan fathers of the San Francisco mission began forced conversions of Native Americans to Christianity and brought Coast Miwok to mission lands, causing a partial abandonment of native settlements. Subsequent ranching and settlement by Mexicans and Americans further displaced Coast Miwok from their homes and subjected the group to homicide and epidemic diseases (Kelley, 1978).

Although the Coast Miwok population declined dramatically, the National Park Service, the Miwok Archaeological Preserve, and individuals of at least partial Coast Miwok descent began recreating the village of Kule Loklo (Bear Valley) on the Point Reyes National Seashore. Dances and local festivals reflecting Coast Miwok traditions are now held at Kule Loklo (Eargle 1986:67, 84–85).

3.7.1.3 Historic Setting

Early History

Marin County was one of the original 27 counties created when California became a state in 1850. It is dotted with numerous dairy farms as well as poultry and stock ranches. The Golden Gate National Recreational Area also makes up a sizeable portion of the county (Hart, 1978: 259).

As early as the 1500s, Europeans such as Frances Drake and Sebastian Rodriguez Cermeno explored the region. By the early nineteenth century, missionization of the area was underway when Spain established Mission San Rafael Archangel in present-day San Rafael. After 1822, Mexico gained independence from Spain and began allowing its citizens land grants throughout Alta California. In 1848, the United States defeated Mexico in the Mexican-American War, and Mexico surrendered its Alta California land in the Treaty of Guadalupe Hidalgo. Livestock grazing, in addition to agricultural and dairy farming, comprised the principal industries during this period (Kyle et al., 1990: 172-174; Mason and Van Cleave Park, 1975: 156).

Once it became a state, California assumed ownership of much of the land within its borders, including lands under navigable streams, lakes, or harbors; land acquired through purchase, condemnation, or gift; and land that was obtained through *rancho* land title disputes. In addition, through the Swampland Act of September 28, 1850 (also known as the Arkansas Act), the federal government granted California public land throughout the state (amounting to over 2 million ac) that was subject to overflow and therefore unprofitable for agricultural use unless reclamation work was undertaken (Robinson, 1948:191–192). With federal assistance, the swamp and overflow land was identified, surveyed, certified, and then patented to the state. The state, in turn, issued a state patent to future swampland purchasers.

Hamilton Army Air Field

The HAAF parcel was originally part of Hamilton Field, which the U.S. military constructed between 1931 and 1935 as a bombardment base (i.e., for the training of bomber crews). As one of three such bases in the United States at the time, the airfield played a vital role in the development of air defense mechanisms on the West Coast in the 1930s and in the training and processing of units during the early 1940s. From 1947 through 1960, the Air Force used the facility (including portions of the State Lands Commission [SLC] parcel) to conduct defense and training operations and renamed Hamilton Field to Hamilton Air Force Base. By the early 1970s, the U.S. Navy and Coast Guard, in addition to the Air Force, occupied the base. In 1984, the base was conveyed to the Army and renamed Hamilton Army Air Field. Shortly thereafter the facility was decommissioned and the land was transferred to private-sector ownership, with some land transferring to the Coastal Conservancy (PAR Environmental Services, Inc. 1993).

3.7.1.4 Cultural Resources in the Project Vicinity

Based on a records search conducted for the BMKV portion of the HWRP at Northwest Information Center of the California Historical Resources Information System in June 2006, there are several Nels Nelson archaeological sites along the San Pablo Bay shoreline in Marin County. Settlement and village locations tend to be in areas where favorable resources are present, including access to freshwater and shelter from elements. Large shellmounds in the San Francisco Bay region tend to be located near the shoreline. However, there are no identified archaeological resources in the vicinity of the project area.

The California SLC (CSLC) online shipwreck database (http://shipwrecks.slc.ca.gov/shipwrecksdatabase_database.asp) was reviewed in 2006 and again in February 2008. The CSLC database is comprised of a list of shipwrecks by county and is based primarily on historic accounts of these incidents. Based on this search, there are two shipwrecks in the Marin County portion of San Pablo Bay (see Table 3.7-1 and Figure 3.7-1). The locational information in latitude and longitude is imprecise: one minute of latitude or longitude is about 1 mi. The descriptions of the locations indicate that two of the shipwrecks are in San Pablo Bay, Marin County.

Table 3.7-1. Shipwrecks in Vicinity of Project Area (Marin County portion of San Pablo Bay)

CSLC Shipwreck Name	Latitude	Longitude	Location	Description
Sehome	37º59’24”N	122°27’00”W	Marin	Oil Screw sunk 1918
Maryland	37°58’00”N	122°29’16”W	Marin	Steamship burned 1913

Source: CSLC Reflex Database, updated 9 August 1991, amended 30 April 2002.

There are several more shipwrecks located within the greater San Pablo Bay (Figure 3.7-1) and mapping of these types of resources is often imprecise. Additional research may be necessary if the project area changes. In addition, unrecorded shipwrecks, airplane crashes, or ordnance may be present within the ATF basin site, along the dredged material transfer pipeline alignment, or along the direct channel alignment.

Paleontology Setting

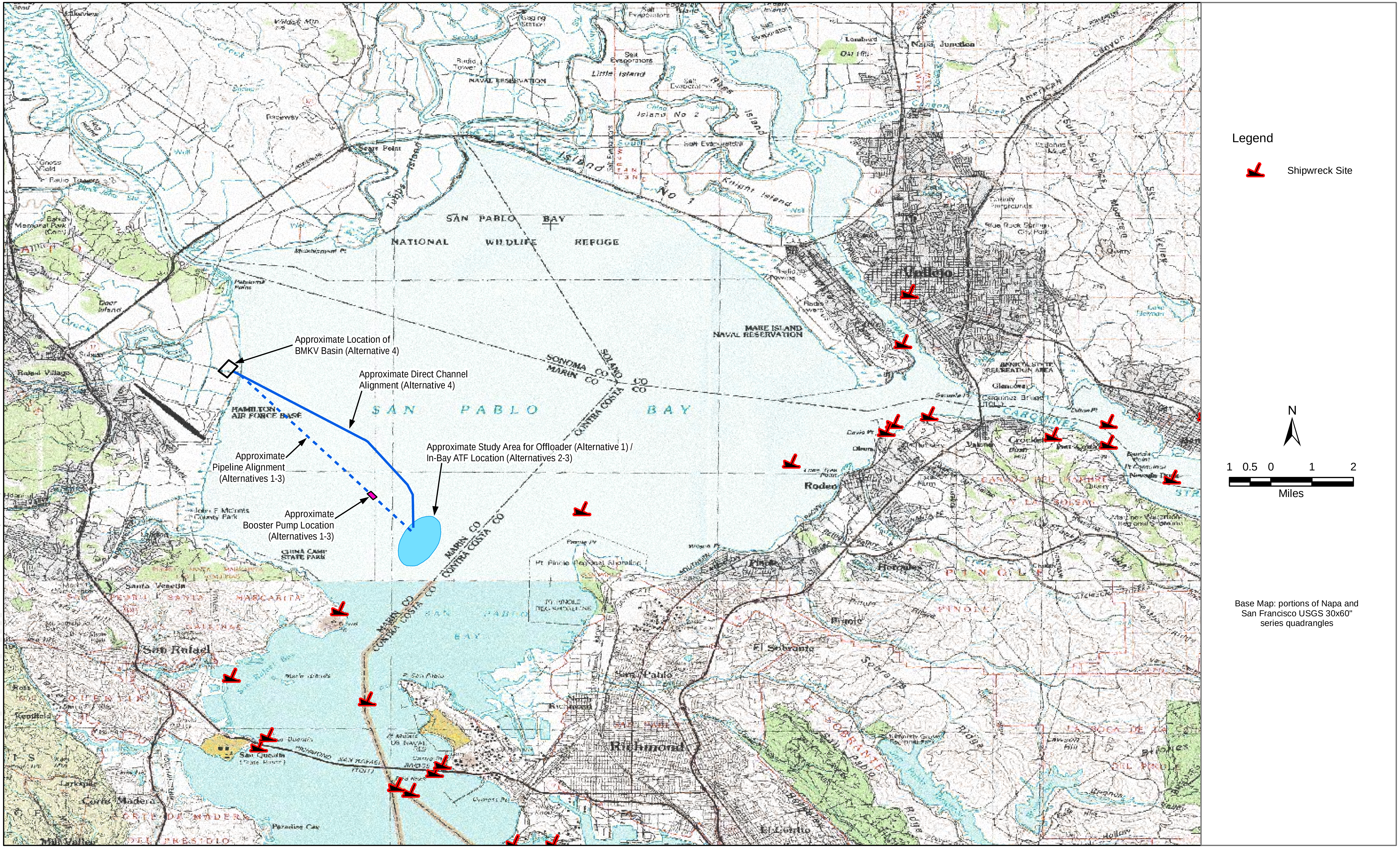
As discussed in Section 3.2, *Geology and Seismicity*, the proposed BMKV basin site is situated on artificial fill placed over Holocene Bay mud deposits. The proposed sites for the in-Bay ATF basin, movement lanes, access channel, and direct channel in San Pablo Bay are also underlain by Holocene bay muds (Wagner and Bortugno, 1982).

The bay muds in the upper subsurface are composed of clay, silt, and sand containing abundant organic material, deposited in the San Francisco Bay estuary over the last 10,000 years (Blakeet al. 2000; Sloan, 2006). Underlying portions of the bay mud sequence are as old as 570,000 years (Middle Pleistocene) and include alluvial/fluvial deposits interbedded with estuarine strata (see summary discussion in Sloan 2006). The younger portions of the bay mud sequence contain a variety of fossil materials, including foraminifera (e.g., McGann 1995) that have been utilized in studying the history of the San Francisco Bay topographic depression.

3.7.1.5 Native American Consultation

Native American Coordination was initiated on August 12, 2008. A letter was sent by ICF Jones & Stokes archaeologist, Michelle C. Jerman, Registered Professional Archaeologist (RPA), requesting the California Native American Heritage Commission (NAHC) search its sacred lands files for the project area. The letter also requested a list of Native American groups and/or individuals the NAHC thinks would have information regarding sacred sites and/or archaeological resources in the project area.

USACE will formally consult with federally recognized tribes(s) and interested Native American groups and/or individuals regarding the project based on the response from the NAHC. In addition, USACE will formally inform the Federated Indians of Graton Rancheria and possibly others identified as being associated with the upland areas of the BMKV site.



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ICF Jones & Stokes
an ICF International Company

Figure 3.7-1
Shipwrecks in the Vicinity of the Proposed Project and Alternatives

Section 3.8
Land Use

3.8.1 Existing Conditions

Existing conditions information was compiled for discussion of the affected environment relative to land use by reviewing relevant technical reports, local and county General Plan documents, land use data available in the Association of Bay Area Government's (ABAG's) Geographic Information System (GIS) Map Portal (ABAG 2007), U.S. Census 2000 data, and previous SEIS/EIR documents for the HWRP and BMKV sites.

3.8.1.1 Regional Setting

Although the proposed ATF would be located in open water in San Pablo Bay, land use activities within adjacent communities could potentially be affected. Therefore, following sections provide a baseline description about land uses along San Pablo Bay shoreline.

Land Uses along the Shoreline

Nine communities reside along the shores of San Pablo Bay, including the cities of Hercules, Novato, Pinole, Richmond, San Rafael, and Vallejo, as well as the unincorporated communities of Black Point-Green Point, Rodeo, and San Venetia. Land uses along San Pablo Bay margins range from protected open space and residential communities to industrial facilities and military operations. A total of 383,000 inhabitants reside in the nine communities that border San Pablo Bay's shoreline. Figure 3.8-1 illustrates the city and county jurisdictions adjacent to the project area. Table 3.8-1, which follows at the end of the section, provides a description of the shoreline land uses within each community.

Commercial-Industrial Shipping

The San Francisco Estuary area is a major west coast shipping center. Millions of tons of cargo pass through the Golden Gate each year, reaching eight public ports in San Francisco Bay. Shipping, cargo, and other large vessels using San Francisco Bay and San Pablo Bay include the Port of Oakland, Port of Sacramento (79 nautical mi) (146 km) northeast of San Francisco Bay), Port of Stockton (75 nautical mi [139 km] east of San Francisco Bay), Port of San Francisco, Port of Richmond, and San Rafael Rock Quarry. Section 3.11, *Transportation and Marine Navigation*, provides more detailed description of each commercial-industrial shipping facility.

Parks and Open Spaces

Numerous park and open space lands are located along the shores of San Pablo Bay, totaling just over 47,000 ac (about 19,020 ha). The largest of these open space areas are described in Table 3.8-2, which follows Table 3.8-1 at the end of the section. Only one of these areas is closed to the public;

the rest are available for public recreation and wildlife viewing. Many of these parks provide access to San Pablo Bay for fishing and boating activities.

Dredged Material Placement

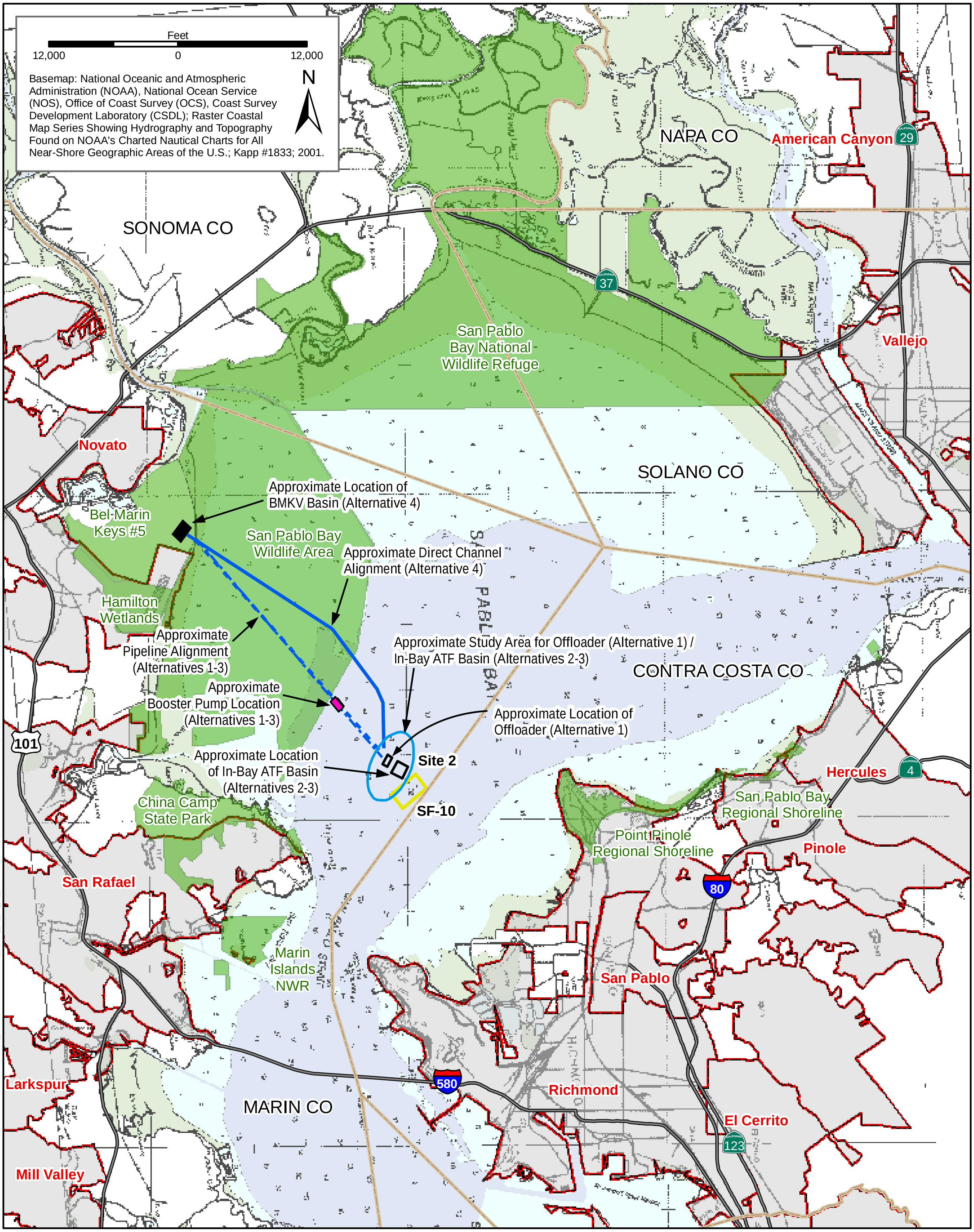
Dredged material from San Francisco Bay is typically placed either in-Bay or ocean disposal sites, or is transferred for beneficial use in upland sites. In-Bay placement can occur at one of four designated ocean disposal sites, two of which are located in San Pablo Bay. SF-10 is located along the eastern boundary of the project area, while SF-9 is located east of the project site in the Carquinez Straits. Dredged material placement on upland sites includes the HWRP, Montezuma Wetlands, Bair Island, Van Sickle Island, and many others. As discussed earlier in Chapters 1 and 2, Alternative 1: No Action, is currently part of the sediment delivery process for the HWRP site. Section 3.1, *Existing Dredged Material Placement*, includes a detailed description of the designated aquatic disposal and beneficial use sites.

Recreational and Commercial Boating

The proposed ATF site consists of tidal estuary waters popular for sturgeon and striped bass fishing in the winter and spring. However, recreationalists take to the waters year-round for sport fishing, boating, and wildlife viewing. Commercial anglers are also present in San Pablo Bay, reaching the many industrial ports that serve commercial industries. San Francisco Bay is one of the six major commercial fishing areas in California (Monroe et al. 1992). Although more than 80 different aquatic species are caught in San Francisco Bay each year, salmon and pacific herring are the two most economically important. Recreational sailboats, yachts, and commercial anglers orient around the numerous marinas in and around San Pablo Bay, such as (clockwise from San Rafael): the Loch Lomond Marina in San Rafael, Bel Marin Keys near Novato, Sonoma Marina and Port on Petaluma River and Mira Monte Marina further upstream, Vallejo Municipal Marina in Vallejo on the Napa River, San Pablo Yacht Harbor on Point San Pablo, Richmond Yacht Harbor and other smaller ones in Point Richmond, and Paradise Cay Yacht Club east of California City. Sections 3.9, *Recreation and Commercial Fishing*, and 3.11, *Transportation and Marine Navigation* provide additional detail about recreational and commercial fishing in San Francisco and San Pablo Bays.

Onshore Setting BMKV

The 51-ac (21-ha) portion of the BMKV site that would be used for the BMKV Basin and perimeter levee in Alternative 4 is currently used for non-irrigated dryland farming. The agricultural potential of the BMKV site was assessed during the preparation of the BMKV SEIS/EIR. The BMKV site is not prime agricultural land and supports a very minor part of current County agricultural production. The BMKV site is also not currently under a Williamson Act contract. The site is however, identified as farmland of local importance (USACE, 2006c).



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County Boundary
Major Roads
Park/Wildlife Area
City Limits

Figure 3.8-1
Land Use Setting

Table 3.8-1. Land Use and Population Data for Communities along San Pablo Bay

Area	2005 Population Estimate	Description of Land Uses along the Shoreline
Counties		
Contra Costa	1,024,300	The western Contra Costa shoreline is dominated by heavy industrial facilities, while residential and open space uses stretch north of Point Pinole.
Marin	248,700	The Marin coastline varies between protected open space and mixed urban development. The new Hamilton community includes residential, community facilities, commercial, parkland, and wetlands. The Bel Marin Keys community includes 700 single-family homes located along two managed lagoons.
Solano	411,700	San Pablo Bay National Wildlife Refuge and Mare Island Naval Shipyard comprise a majority of the Solano County shoreline. Closed in 1996, Mare Island is currently undergoing redevelopment with residential neighborhoods, commercial/industrial uses, and open space.
Sonoma	466,900	San Pablo Bay National Wildlife Refuge lines the Sonoma County shoreline.
Cities (County)		
Hercules (CC)	24,100	Regional open space and residential neighborhoods line the Hercules shoreline.
Novato (M)	50,300	Mixed residential, open space, and commercial/industrial uses line the Novato shoreline, including the “New Hamilton Partnership” with residential, offices, light industrial, retail, parks, open space, and sport fields.
Pinole (CC)	19,100	Regional open space and residential neighborhoods line the Pinole shoreline.
Richmond (CC)	102,200	Employment and industrial uses dominate the shoreline, including Chevron’s Richmond Refinery and other port uses.
San Rafael (M)	55,700	Residential homes overlook San Pablo Bay from the ridgeline, while San Quentin State Prison sits along the shoreline.
Vallejo (So)	117,500	The former Mare Island Naval Shipyard separates Vallejo from San Pablo Bay (across the Napa River outlet). Industrial uses line the Napa River channel on the east side.
Census Designated Places (County)		
Black Point-Green Point (M)	1,100	Located between Novato Creek and the Petaluma River, Black Point-Green Point is primarily a residential community.
Rodeo (CC)	8,700	Mixed residential, open space, and heavy industry share the Rodeo shoreline, between Hercules and the Carquinez Bridge (Interstate 80 [I-80]).
Santa Venetia (M)	4,300	Bordering China Camp State Park on the north, Santa Venetia is primarily a residential community.

County Abbreviations:

CC—Contra Costa County; M—Marin County; So—Solano County; Sa—Sonoma County

Source: U.S. Census, 2007

Table 3.8-2. Parks and Open Space along San Pablo Bay

Park Name	Acreage	Description of Land Uses
San Pablo Bay National Wildlife Refuge	13,190	Located along the north shore of San Pablo Bay in Sonoma, Solano, and Napa counties, the refuge currently consists of open water, salt marsh, upland habitat, and agricultural lands. It encompasses the largest remaining continuous patch of pickleweed-dominated tidal marsh in the northern San Francisco Bay, and preserves habitat critical for millions of shorebirds and waterfowl.
San Pablo Bay Wildlife Area	11,040	Consists of mudflats and surrounding San Pablo Bay waters in Marin County, between the mouths of the Petaluma River and Gallinas Creek.
China Camp State Park	1,512	The historic site of a Chinese shrimp-fishing village in the 1880s, the park offers a variety of natural scenery, trails along San Pedro Ridge, and recreational facilities.
Marin Island National Wildlife Refuge	339	Located in Marin County, southwest of the project area, the refuge hosts one of the largest heron and egret rookeries in northern California. This unique island habitat also supports other breeding migratory birds, and its surrounding mud flats and waters are frequented by many species of shorebirds.
Point Pinole Regional Shoreline	2,315	A large parkland right next to densely-populated Contra Costa County shoreline, this park offers trails leading through breezy meadows, eucalyptus woodlands, or along bluffs and beaches on San Pablo Bay. Point Pinole's 1,250-foot-long fishing pier is a key attraction for anglers fishing for sturgeon, striped bass, bay rays, leopard sharks, perch, kingfish, and flounders.
San Pablo Bay Regional Shoreline		This stretch of shoreline in Contra Costa County is closed to public access.

Section 3.9
Recreation and Commercial Fishing

3.9.1 Existing Conditions

Existing conditions information for recreation and fishing was compiled by reviewing relevant technical reports, conducting research through publicly available sources, and using GIS for mapping and limited spatial and visual analysis. The description of existing conditions includes, fishing, hunting, boating, shoreline activities, access, and site activity.

3.9.1.1 Regional Conditions

The proposed ATF site, located in San Pablo Bay, consists of tidal estuary waters and is adjacent to an area known by fishermen as the "Sturgeon Triangle." This area, in particular, is popular for sturgeon and striped bass fishing in the winter and spring. However, recreationalists take to the waters year-round for sport fishing, boating, and wildlife viewing. The amount and type of boater activity related to sport fishing is dictated by the open and closed seasons as mandated by the CDFG. Over 200 marinas provide service and maintenance for the thousands of boaters that use the waters of San Francisco Bay each year (Monroe et al., 1992). More information related to the different user groups of fishing, hunting, and boating is described below.

Fishing

Within San Pablo Bay, 56 fish species are known to exist, most of which are euryhaline (able to live in waters with a wide range of salinity) adapted. The following are important to commercial and recreational anglers: salmon, steelhead, American shad (*Alosa sapidissima*), California halibut (*Parlichthys californica*), starry flounder (*Platichthys stellatus*), white croaker (*Genyonemus lineatus*), white sturgeon (*Acipenser transmontanus*), striped bass (*Morone saxatilis*), several surf perches, leopard shark (*Triakis semifasciata*), sevengill shark (*Notorhynchus cepedianus*), and Pacific herring (*Clupea pallasii*). Figure 3.9-1 shows where some of these species are known to reside and, consequently, where recreational anglers may be active.

Of the species mentioned above, salmon and pacific herring resources are the two most economically important species to commercial harvesters in the region. The majority of commercial salmon fishing occurs in the open ocean. Pacific herring commercial activities do not occur in San Pablo Bay (CDFG, 2006). There is, however, a minor commercial fishery for bay shrimp that has been declining over time (Life Science, 2004). Other species of significance in relation to the project area include the sevengill shark, which typically populates deep channel areas in southern San Pablo Bay, and steelhead trout and Sacramento splittail, which are known to frequent the SF-10 dredge in-Bay disposal site. Table 3.9-1 describes the fisheries and fishing seasons for San Pablo Bay.

Table 3.9-1. San Pablo Bay Fisheries and Fishing Seasons

Species	Fishing Season
Striped bass	Year round (Jun–Aug and Oct–Nov best times)
White sturgeon	Nov–May on flats
Starry flounder	Winter–spring on flats
Pacific herring	Dec–Mar spawning runs
Surfperch	Spring
King or Chinook salmon	Late summer
Various sharks	Spring, summer, fall
American shad	May–June
White croaker	Year round
California halibut	Early spring
Source: USACE 1998	

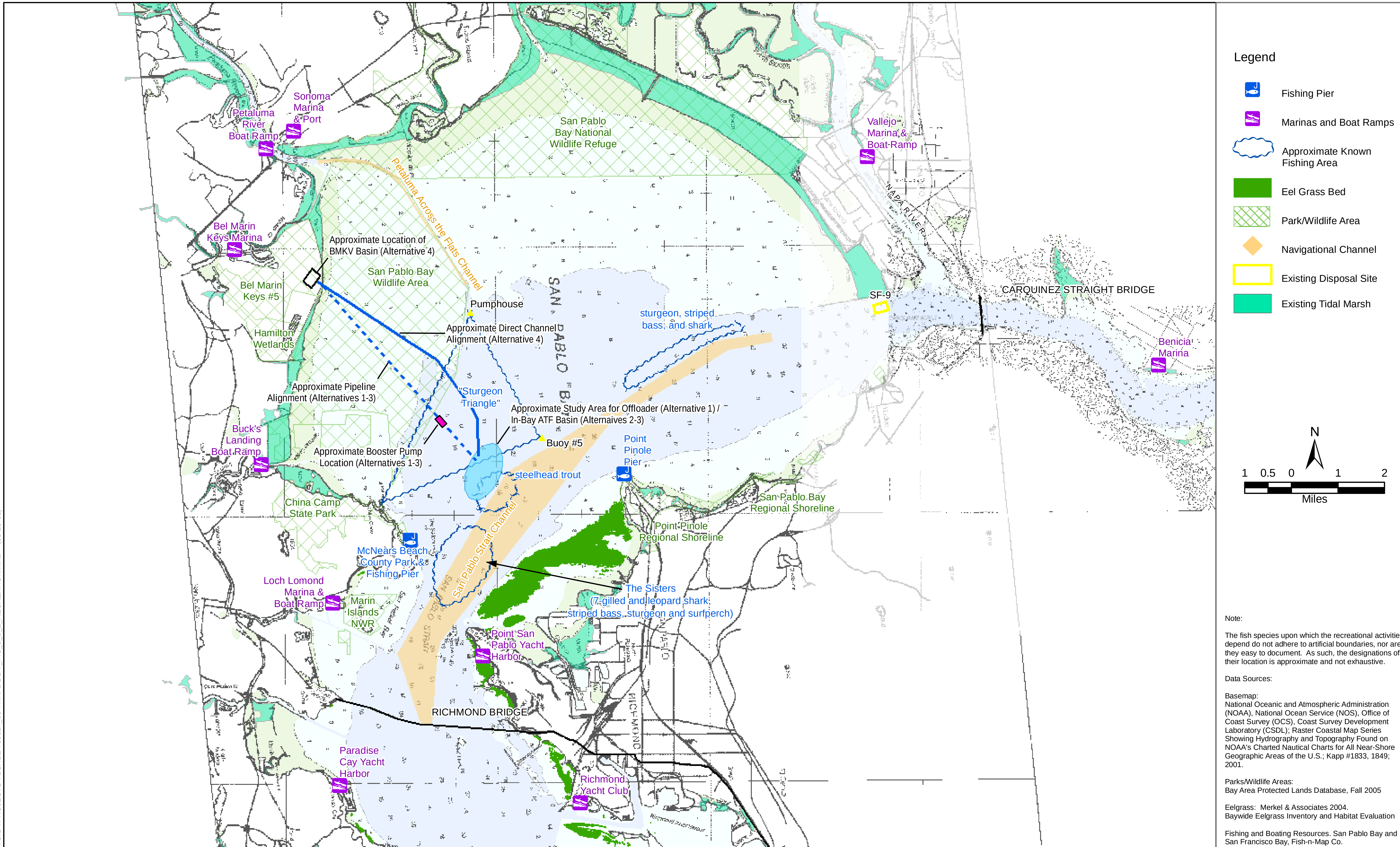
Approximately 1,500 ac (607 ha) of eelgrass beds grow directly north of San Pablo Point and expand towards Pinole Point (Figure 3.9-1), supporting some of the species listed above and southeast of the project site. This habitat represents food, shelter, and rearing resources for numerous invertebrates and fish, including juvenile salmon, rockfish, and pacific herring.

Given the extensive fishing resources in San Pablo Bay, recreational users have many locations ideal for estuarine fishing. With proximity to the project site, land-based fishing concentrates on two primary piers: McNear's Beach Fishing Pier and Point Pinole Fishing Pier (Figure 3.9-1). In terms of on-the-water sites, of particular note are 1) the eel grass beds mentioned above, 2) the "Sturgeon Triangle", 3) the Pinole Shoal Channel, and 4) around Point San Pedro (approximately 0.5 mi [about .8 km] south of McNear's Beach and Fishing Pier). The eelgrass beds require small craft and experienced fisherpersons. The "Sturgeon Triangle" is in the middle of San Pablo Bay, and in addition to being an excellent sturgeon fishing ground, it also supports striped bass during the late summer and fall, and shark during spring and summer. Although heavily trafficked with shipping and tankers, the areas adjacent to the north Pinole Shoal Channel are good for sturgeon during the winter, striped bass during the fall, and shark during the spring. Point San Pedro has a number of areas (such as the Sisters, the Birdcage, McNear's Brickyards) that offer striped bass, sturgeon, and surfperch (Fish-n-Map ND).

Commercial Fish Species

Commercial fish species found in the Bay include anadromous and resident species, crab, and shrimp. All portions of the Bay support commercially and/or recreationally important fisheries. Important commercial and recreational fishes that exist in the Bay include: striped bass (*Morone saxatilis*), Northern anchovy (*Engraulis mordax*), Pacific herring (*Clupea harengeus*), American shad (*Alosa sapidissima*), white and green sturgeon (*Acipenser* spp.), English sole (*Parophrys vetulus*), starry flounder (*Platichthys stellatus*), Dungeness crab (*Cancer magister*)[1], blacktailed shrimp (*Crangon nigricauda)*, blackspotted bay shrimp (*Crangon nigromaculata*), California bay shrimp

[1]A description of the Dungeness crab life stages, habitat requirements, and potential for occurrence in the project area is discussed in Section 3.5, *Marine and Terrestrial Biology*. This section discusses Dungeness crab as a commercial fishery resource in San Pablo Bay.



Note:

The fish species upon which the recreational activities depend do not adhere to artificial boundaries, nor are they easy to document. As such, the designations of their location is approximate and not exhaustive.

Data Sources:

Basemap:
National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Office of Coast Survey (OCS), Coast Survey Development Laboratory (CSDL); Raster Coastal Map Series Showing Hydrography and Topography Found on NOAA's Charted Nautical Charts for All Near-Shore Geographic Areas of the U.S.; Kapp #1833, 1849; 2001.

Parks/Wildlife Areas:
Bay Area Protected Lands Database, Fall 2005

Eelgrass: Merkel & Associates 2004.
Baywide Eelgrass Inventory and Habitat Evaluation

Fishing and Boating Resources. San Pablo Bay and San Francisco Bay, Fish-n-Map Co.

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Figure 3.9-1
Recreation

(*Crangon franciscorum*), and an introduced shrimp from Korea, *Palaemon macrodactylus* (SFEP 1992a).

Hunting

Birds known to rest, feed, and potentially roost in and around the location of the dredged transfer site include diving birds such as coots, American avocets, black-necked stilts, herons, egrets, morehens, ducks, scaups, grebes, gulls, pelicans, terns, pigeons, and falcons. Peak season for most species of shorebird, waterfowl, and raptors is September through March.

As part of San Pablo Bay Wildlife Area, duck blinds on the Western Flats are available on a first-come, first-served basis. This represents the primary facility provided to recreational hunters within the project area. Hunting at these sites is overseen by the CDFG and is limited to waterfowl, coots, and moorhens. The only way to access the duck blinds that are dotted around the outskirts of San Pablo Bay is by boat. Most of the hunting on San Pablo Bay occurs around the periphery. The dredged material pipeline in Alternatives 1–3 and the direct channel in Alternative 4 cross within the general proximity of several duck blinds.

Boating

San Pablo Bay consists of approximately 58,000 ac (about 23,472 ha) of variable depth waters, ranging from inches around the perimeter to greater than 60 feet (about 18 m) in the San Pablo Channel. Three primary shipping channels within San Pablo Bay dictate the majority of the large vessel boating activity. For more discussion of the channel system and its larger commercial users, please see Section 3.11, *Transportation and Marine Navigation*.

Although they represent only a small fraction of the boating uses on San Pablo Bay, both fishing and hunting depend on boats to access outlets for their respective pursuits. Other small vessels and interest groups include recreational sailing boats and yachts, commercial and sport fishing boats, and personal watercraft such as jet skis, kayaks, and sailboards.

In terms of recreational access, ramps are dispersed throughout San Pablo Bay and provide public access to the water for boat owners. Public ramps include Buck's Landing on Gallinas Creek, Loch Lomond Marina in San Rafael Bay, Petaluma River Boat Ramp and Sonoma Marina at the mouth of the river, and Vallejo Boat Ramp on the Napa River (Figure 3.9-1). These access points create a vector of boater traffic, particularly during weekends and holidays.

Marinas that readily access San Pablo Bay are (clockwise from San Rafael): the Loch Lomond Marina in San Rafael, Bel Marin Keys near Novato, Sonoma Marina and Port on Petaluma River and Mira Monte Marina further upstream, Vallejo Municipal Marina in Vallejo on the Napa River, San Pablo Yacht Harbor on Point San Pablo, Richmond Yacht Harbor and other smaller ones in Point Richmond, and Paradise Cay Yacht Club east of California City (Figure 3.9-1). Other small yacht clubs are distributed around San Pablo Bay. Furthermore, other marinas to the south and east of San Pablo Bay have marinas and boaters that can access the location of the project site.

Once recreational boaters are on the water in San Pablo Bay, a range of targets for trips is available to them. These include:

- China Camp State Park
- Sacramento River Delta
- Napa River
- Petaluma River
- Gallinas Creek
- McNear's Beach County Park
- Point Pinole Regional Shoreline
- San Pablo Bay National Wildlife Refuge
- San Pablo Bay Wildlife Area

Shoreline Activities

The location of the project area in the middle of San Pablo Bay precludes the majority of the impacts on land-based recreational activities. The two recreational areas closest to the site that may be impacted visually or acoustically are China Camp State Park and Point Pinole Regional Shoreline. At both, there are trails available to mountain- and road bikers, hikers, and skaters as well as good locations for open water and intertidal fishing, picnicking, and bird watching. At China Camp State Park, the multi-use trails are available to equestrians, and 30 walk-in, overnight camping sites at Back Ranch Meadows are open to the public.

Access and Site Activity

At the present moment, access to the proposed ATF site is unlimited, as no physical structures exist at or around SF-10. SF-9 and SF-10 may currently be used by recreational users. SF-9 use would most likely involve drift or trawl activities that would pass through the site. SF-10 users would most likely involve both drift or trawl activities as well as anchoring and stationary activities that would remain at the site. Section 3.11, *Marine Navigation and Transportation*, provides more details, calculations, and discussion about vessel trips.

Section 3.10
Petroleum and Hazardous Materials

3.10.1 Existing Conditions

Within San Pablo Bay and the surrounding shorelines, there are various refineries, tank farms, previous military activities, dumped and mined material, urban and agricultural runoff, and other potential sources of petroleum products and hazardous materials and wastes. However, for the context of this discussion, the relevant setting information focuses on those sites that would be used by the proposed action and alternatives: the ATF basin site, the transfer pipeline alignment, the direct channel, and the BMKV basin.

Existing conditions information was compiled by reviewing relevant technical reports, as well as federal, state, and local regulations identified as relating to aquatic transfer facility operations and transfers (including dredging). Potential impacts on public health from the release of onsite storage or transported contaminants were reviewed, including an assessment of toxicity and potential exposure pathways. The descriptions of hazardous materials' investigations and cleanup operations refer to areas of concern within San Pablo Bay. Also, possible sources of introduced hazardous substances from fill materials are described.

3.10.1.1 Site-Specific Petroleum and Hazardous Material Conditions

Dredged Material Operations in San Pablo Bay

Chapter 2, *Description of Alternatives* provides a summary of the most commonly used equipment in dredging operations. Within San Pablo Bay, federal dredging activities occur along the Pinole Shoals channel and the Petaluma across the Flats Channel and dredged material is placed at the existing SF-10 and SF-9 dispersive sites. Existing dredging disturbs sediments in San Pablo Bay which can contain concentrations of petroleum and hazardous constituents. In addition, existing dredging activity includes the potential for release of petroleum products or hazardous materials from dredging vessels.

Sediment Quality in San Pablo Bay

A variety of anthropogenic sources have led to the release of petroleum and hazardous materials that affect the sediment quality in San Pablo Bay. Section 3.4, *Water and Sediment Quality,* of this SEIS/EIR discusses these sources and the proposed action and alternatives' potential effect on the water and sediment quality of San Pablo Bay.

Potentially Contaminated Areas along the Transfer Pipeline Alignment

Source areas where previous operations or activities may have generated hazardous substances and/or wastes on the Bay shoreline are described below. Additional site information is described in the *Hazardous Materials* sections of the HWRP SEIS/EIR and BMKV SEIS/EIR.

State Lands Commission Parcel

A Remedial Investigation Report for the SLC site was completed in 2001 (Shaw Environmental & Infrastructure, 2001), which characterized the nature and extent of contamination resulting from military activities. Groundwater, soil, and sediment samples were taken from 13 areas on the SLC site. Potential contaminants in the tidal salt marsh that may be impacted by the transfer pipeline alignment include lead, other metals associated with ammunition, and petroleum hydrocarbons. The area of lead impact is estimated to be 9.5 ac (about 3.8 ha) and is confined to an area from east of the Small Arms area to the Abandoned Automobile area (Shaw Environmental & Infrastructure, 2001).

Hamilton Army Airfield Parcel

In the Comprehensive Remedial Investigation Report (IT Corporation 1999a), USACE identified the nature and extent of potential contamination on the HAAF site. According to the report, a variety of military facilities and functions occurred at Hamilton that could potentially have resulted in soil contamination. Based on historical investigation, the contaminants detected at various sites on the Hamilton property include total petroleum hydrocarbons (diesel, gasoline, JP-4, or motor oil), metals, dioxins and furans, VOCs, semi-volatile organic compounds (SVOCs) including PAHs, PCBs, and pesticides (IT Corporation, 1999a). Remedial sites at the HAAF include 5 tidal salt marsh sites bayward of the perimeter levee. In 2004 and 2005 the excavation of the title salt marsh sites was completed. Between 1998 and 1999, interim removal actions were completed inboard of the perimeter levee on many of the sites where elevated levels of contaminants were found. Clean up of the HAAF is currently under the BRAC process (Keller pers., comm.).

Potentially Contaminated Areas at BMKV Basin Site

A Phase I Environmental Site Assessment and a Shallow Soil Investigation were completed in 1994 and 2002, respectively, for the BMKV site. The Phase I, prepared by Miller Pacific Engineering Group, identified several items that warranted further attention. The Shallow Soil Investigation, prepared by Erler and Kalinowski, revealed several source areas on the BMKV site that exhibited low-level contamination due to the presence of various hazardous substances and/or waste. However, none of the areas of concern previously identified in the BMKV SEIS/EIR are located within the proposed the BMKV basin site under Alternative 4.

Section 3.11
Transportation and Marine Navigation

3.11.1 Existing Conditions

Existing conditions information for Transportation and Marine Navigation was compiled by reviewing relevant technical reports, conducting research on publicly available sources, and through the use of GIS for mapping and analysis.

3.11.1.1 Definition of Transportation and Marine Navigation Project Area

In general, marine hazards to navigation include: 1) shoals and islands, 2) bridges and other structures, 3) fog and inclement weather, 4) tides and currents, and 5) vessel traffic. For the first two categories, standard aids to navigation such as horns, bells, and lights are in use at appropriate locations near submerged rocks and points of land. The authorized use of a hydraulic off-loader facility (Alternative 1), the proposed ATF (Alternative 2), and the confined ATF (Alternative 3) would be considered category 2 hazards; the direct channel (Alternative 4) has underwater features with navigational aids only. All four alternatives would be subject to category 4 and 5 hazards in San Pablo Bay, discussed below.

Tidal action causes extremely strong currents throughout San Pablo Bay during periods of maximum ebb and maximum flood tides. The greatest currents around the proposed ATF site occur in the range of 2 to 3 knots (3.7 to 5.6 km per hour) (MacWilliams and Cheng, 2006). Currents above 2 knots (3.7 km) are considered strong and potentially hazardous (USACE and Port of Oakland, 1998). Transport vessels delivering dredged sediment, as well as other commercial, naval, and recreational boaters, must take great care in maneuvering within ebb and flood tides.

Ship traffic density increased from approximately 87,000 movements in 1987 to an estimated 97,900 in 1995 (USACE and Port of Oakland, 1998). Large commercial and naval vessels are required by U.S. Coast Guard regulations to use designated traffic lanes when traveling in inland waterways. Smaller commercial and private vessels do not travel within specific traffic lanes, but rather in the most direct safe route from point A to point B. These two divergent traffic patterns and styles of movement can cause hazards to both types of boaters. However, one member of this second group, ferry vessels—which represent approximately 68% of all vessel movements in San Francisco Bay (USACE and Port of Oakland, 1998)—presents a lesser hazard since they follow set routes and their captains are very familiar with San Pablo Bay's environs. On weekends, private vessel traffic increases.

3.11.1.2 Regional Transportation and Navigation

Shipping Channels and Marine Infrastructure

Three primary shipping channels within San Pablo Bay convey the majority of the marine transportation activity. These channels support two flows of traffic.

For the first, consisting of predominantly large commercial vessels, two primary channels—San Pablo Strait and Pinole Shoal—provide a throughway from the Pacific Ocean to Napa River and the Sacramento Bay Delta and beyond. These channels have a southwest–northeast orientation, connecting between San Pablo Strait and Carquinez Strait. Of particular note is the Pinole Shoal Channel, which is dredged and maintained by USACE. It extends approximately 11 mi (about 18 km) across San Pablo Bay, connecting with the San Pablo Strait Channel at its southwestern extent, and Carquinez Strait at its northeastern extent. Portions of the channel are maintained at a level of -45 feet (about 14 m) MLLW with a bottom width of 520 feet (about 159 m).

For the second traffic flow, consisting of predominantly smaller commercial and recreational vessels, a third channel—the Petaluma across the Flats—provides access to the Petaluma River and Port Sonoma. Although it also supports limited commercial shipping and transportation activity, it provides extensive recreational use. This channel has a north–south orientation and connects between San Pablo Strait and the Petaluma River. This channel is maintained by USACE at a level of -11.5 feet (3.5 m) MLLW.

All three channels convey boater traffic in close proximity to the project site.

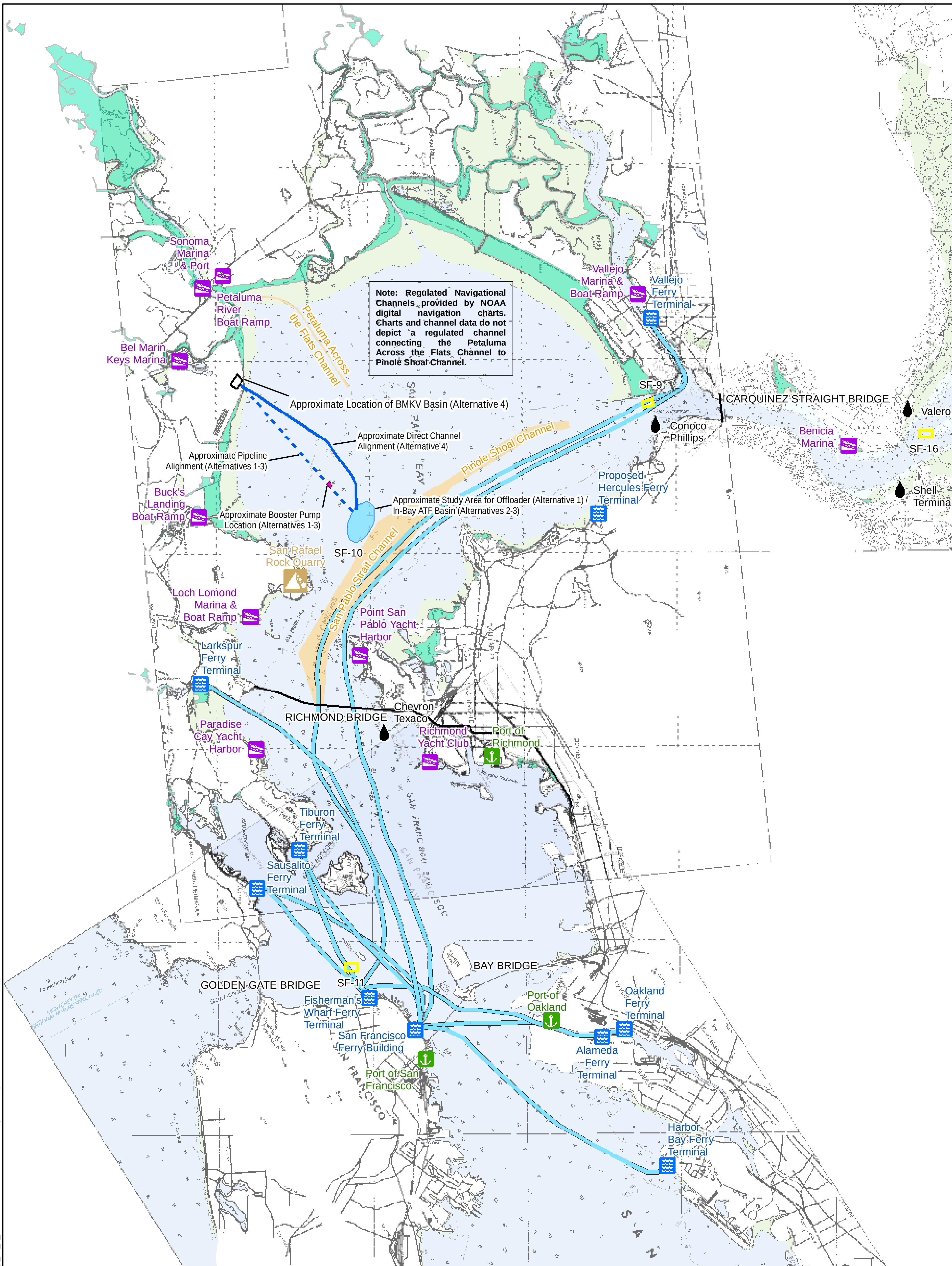
There are a variety of buoys with typical U.S. Coast Guard–prescribed signaling and rights of way distributed around San Pablo Bay for navigational purposes.

Shipping Vessels and Transportation Centers

The area of San Pablo Bay is approximately 64,000 ac (about 25,900 ha). Its marine transportation centers are distributed around the Bay and are identified in Figure 3.11-1.

The various types of vessels proposed for use by the proposed action are described in Section 2, *Description of Alternatives*. The types of non-project boats in San Pablo Bay include oil tankers, cargo and container ships, tug boats, government vessels, passenger ferry ships, recreational boats, commercial and sport fishing boats, boardsails, and personal watercraft such as jet skis and kayaks. Smaller recreational boats (such as smaller recreational anglers, sailboats and personal watercraft) are discussed in Section 3.9, *Recreation and Commercial Fishing*; this section focuses on the larger, commercial users and vessels found mostly in the shipping channels—larger recreational, commercial fishing, ferries, shipping/cargo industry, and oil industry ships and boats.

The first user group considered consists of larger recreational sailboats and yachts, and commercial anglers. Due to their smaller size and draft, they are less confined to the primary and secondary channel. Much of their traffic orients around the numerous marinas in and around San Pablo Bay, such as (clockwise from San Rafael): the Loch Lomond Marina in San Rafael, Sonoma Marina and Port on Petaluma River and Mira Monte Marina further upstream, Vallejo Municipal Marina in Vallejo on the Napa River, San Pablo Yacht Harbor on Point San Pablo, Richmond Yacht Harbor and



Legend

Marinas and Boat Ramps	Ferry Route
Ferry Terminal	Regulated Navigational Area
Port	Existing Tidal Marsh
Oil Facility	Existing Disposal Site
Quarry	

N

1 0.5 0 1 2

Miles

Note: The small harbors south of San Pablo Bay are not included.

Data Sources:

Basemap:
National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Office of Coast Survey (OCS), Coast Survey Development Laboratory (CSDL); Raster Coastal Map Series Showing Hydrography and Topography Found on NOAA's Charted Nautical Charts for All Near-Shore Geographic Areas of the U.S.; Kapp #1828, 1833, 1849; 2001.

Fishing and Boating Resources. San Pablo Bay and San Francisco Bay, Fish-n-Map Co.

Ferry Terminals and Oil Facilities. On-line research, Yahoo Yellow Pages and Google Earth.

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Figure 3.11-1
Transportation/Marine Navigation

other smaller ones in Point Richmond, and Paradise Cay Yacht Club east of California City (see Figure 3.11-1). There are also various small yacht clubs distributed around San Pablo Bay that are not presented in the figure. Furthermore, boaters from other marinas to the south and east can—and do—easily access and use San Pablo Bay.

The second user group is the single- and double-hulled Ferry service. Two primary operators run through San Pablo Bay: Vallejo Baylink Ferry and the Blue and Gold Fleet. For San Pablo Bay, the primary transportation nodes at present are the Vallejo Ferry Terminal, the San Francisco Ferry Building, and San Francisco's Fisherman's Wharf/Pier 41 district. There are proposals to add ferry terminals at the Port of Sonoma, Hercules, and Antioch that could add further ferry traffic through San Pablo Bay.

The third user group is the shipping and cargo industry. Although the size of container ships varies, they can be larger than 1,000 feet (about 305 m) long, up to 110 feet (about 34 m) wide, and draft up to 40 feet (about 12 m). Due to their size, they are limited to the primary shipping channels and do not travel towards the Petaluma River. Due to its similar vessel size and traffic usage, marine traffic associated with the San Rafael Quarry is included in this group. Typically, shipping, cargo, and other large vessels using San Francisco Bay and San Pablo Bay access the following locations (see Figure 3.11-1):

- **Port of Oakland**: located on San Francisco Bay and Oakland Estuary, this seaport ranks among the top four in the nation and top 20 in the world in terms of annual container traffic. The Port occupies 19 mi (about 31 km) of waterfront on the eastern shore of San Francisco Bay, with about 900 ac (about 364 ha) devoted to maritime activities and another 2,600 ac (about 1,052 ha) devoted to aviation activities.
- **Port of Sacramento**: located 79 nautical mi (about 146 km) northeast of San Francisco, the Port is centered in one of the richest agricultural and industrial regions in the world.
- **Port of Stockton**: located on the Stockton Deepwater Ship Channel, 75 nautical mi (about 140 km) due east of the Golden Gate Bridge, the Port of Stockton owns and operates a diversified and major transportation center. Their facilities encompass 2,000 ac (about 809 ha) of operating area.
- **Port of San Francisco**: manages 7.5 mi (about 12 km) of San Francisco Bay on the eastern side of the San Francisco peninsula. The Port's responsibilities include promoting maritime commerce, navigation, and fisheries and providing public recreation. More than 1,000 ac (about 405 ha) fall under its jurisdiction.
- **Port of Richmond**: approximately 9 mi (about 15 km) from the Golden Gate on the east shore of San Francisco Bay, this Port is easily accessible by a federally maintained deep water channel, the Richmond Harbor Channel. Richmond is served by the interstate highway system, specifically Interstate 580. The Port is also served by two major transcontinental railroads, Burlington Northern Santa Fe and Union Pacific. Richmond has 32 mi (about 52 km) of shoreline along the northern and eastern reaches of San Francisco Bay.
- **San Rafael Rock Quarry**: One of two major quarries on the shores of San Francisco Bay, the San Rafael rock quarry is owned and operated by the Dutra Company. Unlike the Desilva quarry at the Dumbarton Bridge, the Dutra quarry has direct water access and most of the materials are shipped by barge. The quarry supplies rock and pavement products for construction projects all over San Francisco Bay and, as such, is a major mover of material around the Bay. The company

started with clamshell dredges in the Delta 100 years ago, and is now involved in marine construction, bridge repair, levee maintenance, dredging, and other shoreline engineering projects. Owned by the Dutra Company since 1986, the quarry has been in operation for over 100 years and the pit is now 200 feet (about 61 m) deep. Dutra expects to continue to quarry at the site for at least another 25 years (Center for Land Use Interpretation, 2007).

The fourth primary user of the transportation network is the oil industry. Oil tankers are often more than 1,400 feet (about 427 m) long, 190 feet (about 58 m) wide, and draft up to 80 feet (about 24 m). The six major oil facilities in and around San Pablo Bay are as following (see Figure 3.11-1):

- Chevron-Texaco facility and Long Wharf in Richmond;
- Conoco-Phillips facility and wharf in Rodeo;
- Shell Terminal on the waters of Carquinez Strait in Martinez;
- Tesoro-Amoco and Tesoro-Avon facilities and piers off the waters of Carquinez Strait in Martinez; and
- Valero facility and pier on the waters of Carquinez Strait in Benicia.

3.11.1.3 Site-Specific Transportation and Navigation Conditions

Presently, the traffic associated with dredged material placement in the project area occurs around the existing in-Bay disposal sites: SF-9, SF-10, SF-11, and SF-16. Section 3.1, *Existing Dredged Material Placement*, provides a detailed description of this activity.

The majority of the trips from dredged material source areas will originate south of the project site (Oakland, Richmond, Larkspur, San Francisco, and Redwood City). Some vessel traffic, however, will come from the east (Pinole Shoal and Tosco/Unocal sites) and the northwest (Petaluma River across the Flats). Table 2-2 in Chapter 2, *Description of Alternatives,* provides an estimate of the dredged material volumes that are anticipated to be available from various source sites around San Francisco Bay in the lifetime of the proposed action.

Section 3.12

Air Quality

3.12.1 Existing Conditions

This SEIS/EIR focuses primarily on the central and western portions of San Pablo Bay, which may be affected by the construction of the proposed action or alternatives. San Pablo Bay is located within the San Francisco Bay Area Air Basin (SFBAAB). The SFBAAB consists of nine counties including Alameda, Contra Costa, Marin, San Francisco, Santa Clara, San Mateo, Napa, and portions of Solano and Sonoma.

Existing conditions for greenhouse gas emissions and climate change are discussed separately in Section 3.15, *Greenhouse Gas Emissions and Climate Change*.

3.12.1.1 Regional Climate and Meteorology

Marin County

Marin County is wedge-shaped, bounded on the west by the Pacific Ocean, on the east by San Pablo Bay, on the south by the Golden Gate, and on the north by the Petaluma Gap. The county is mostly hilly, with most of the population located in small, sheltered valleys on the eastern side of the hills. The weather is warmer and there is less fog in the eastern side of Marin County due mainly to its distance from the ocean, but also to a small degree to the blocking effect of the hilly terrain to the west. Most of the terrain is 800 to 1,000 feet high, although there are a few mountains above 1,500 feet. However, this is usually not sufficient to block the marine layer, which averages 1,700 feet in depth. Because of the county's wedge shape, areas to the north are further from the ocean; this condition allows the marine air mass to be heated before it arrives at eastern Marin County cities. In south Marin County, the distance to the ocean is short and the elevations lower, so there is a higher incidence of cool, unmodified, maritime air.

Temperatures in cities located next to the Bay are moderated by the proximity to the water. For example, San Rafael, which is near the Bay, average maximum winter temperature are in the high 50s to low 60s, and average maximum summer temperatures are in the high 70s to low 80s. Inland areas, such as Kentfield, experience average maximum temperatures 2 degrees cooler in the winter and 2 degrees warmer in the summer.

Along the west coast of Marin, wind speeds are highest—8 to 10 mph. Although most of the terrain throughout central Marin County is not high enough to act as a barrier to the marine airflow, friction caused by the complex terrain is sufficient to slow the airflow. Downwind, at Hamilton Air Force

Base (AFB) in east Marin County, the annual average wind speeds are only 5 mph. Prevailing wind directions throughout Marin County show less variation, and are generally from the northwest.

The mountainous terrain in Marin County has higher rainfall amounts than most parts of the Bay Area, although the southern Santa Cruz Mountains report higher rainfall amounts. Near Mt. Tamalpais, rainfall amounts are twice those in the rest of the Bay Area, with San Rafael reporting an average of 37.5 inches per year and Kentfield reporting 49 inches per year. Further north, Hamilton AFB and Petaluma report 26 and 24 inches per year, respectively. Consistent with the Bay Area Mediterranean climate, 84% of the annual rainfall in Marin occurs November through March.

Air pollution potential is greatest on the eastern side of Marin County, where the semisheltered valleys and largest population centers are located. Currently, most of the development has been along the Bay, particularly in southern Marin. In the south, where distances to the ocean are short, the influence of the marine air keeps the pollution levels low. As development moves further north into valleys more sheltered from the sea breeze, greater pollution will most likely be seen (Bay Area Air Quality Management District, 1999).

Contra Costa County

In the San Pablo portion of Contra Costa County, the prevailing wind direction is southwesterly with over 50% of the winds coming from the south through southwest sector. The average wind speed is approximately 11 mph. The maximum summer temperatures average in the low 70s, and minimums average in the mid-50s. In winter, maximums are in the high 50s to low 60s, and minimums average in the low to mid-40s. Precipitation totals near 22 inches annually, on average.

Frequent ventilation with marine air minimizes the air pollution potential by minimizing the influx of pollutants from area sources in the portion of Contra Costa County adjacent to San Pablo Bay. Occasionally there are elevated pollutant levels due mainly to light winds during the night and early morning. The air pollution potential south and north of the San Pablo Bay region is higher and might be termed marginal. Its location, downwind of and surrounded by air pollution sources, coupled with a relatively high frequency of light winds, mainly in the nighttime and early morning hours, could augment higher pollutant levels (Bay Area Air Quality Management District, 1999).

3.12.1.2 Site-Specific Air Quality Conditions

The existing air quality conditions in the proposed action area can be characterized by monitoring data collected in the region. The nearest air quality monitoring stations in the vicinity of the proposed action area are located in San Rafael and San Pablo. The San Rafael station monitors ozone, carbon monoxide (CO), and particulate matter (PM_{10}), but does not monitor fine particulate matter ($PM_{2.5}$). The San Pablo monitoring station monitors ozone and CO, but does not monitor PM_{10} and $PM_{2.5}$. Air quality monitoring data from the San Rafael and San Pablo monitoring stations are summarized in Table 3.12-1. This data represents air quality monitoring data for the last 3 years (2004–2006) for which complete data is available. As indicated in Table 3.12-1, the San Rafael monitoring station experienced violations of the state 24-hour PM_{10} standard during the years 2004 and 2006, while the San Pablo monitoring station experienced one violation of the state 1-hour ozone standard in 2004. No other violations were observed during the previous 3-year reporting period.

If monitored pollutant concentrations meet state or federal standards over a designated period of time, the area is classified as being in attainment for that pollutant. If monitored pollutant concentrations violate the standards, the area is considered a nonattainment area for that pollutant. If data are insufficient to determine whether a pollutant is violating the standard, the area is designated unclassified.

EPA has classified Marin and Contra Costa Counties as marginal nonattainment areas for the 8-hour ozone standard, moderate maintenance areas (<= 12.7 parts per million [ppm]) with respect to the CO standard, and as unclassified/attainment areas with respect to the PM_{10} and $PM_{2.5}$ standards.

The Air Resources Board (ARB) has classified Marin and Contra Costa Counties as nonattainment areas with respect to the 1-hour ozone standard, attainment areas with respect to the CO standard, and as nonattainment areas with respect to the PM_{10} and $PM_{2.5}$ standards. The Marin and Contra Costa Counties' attainment status for each of these pollutants relative to the National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS) is summarized in Table 3.12-1.

Table 3.12-1. 2007 Marin and Contra Costa Counties' Attainment Status for State and Federal Standards

	Marin County		Contra Costa County	
Pollutant	**Federal**	**State**	**Federal**	**State**
1-hour O_3	NA[1]	Nonattainment	NA[1]	Nonattainment
8-hour O_3	Marginal Nonattainment	NA[2]	Marginal Nonattainment	NA[2]
CO	Moderate maintenance Area (<= 12.7ppm)	Attainment	Moderate Maintenance Area (<= 12.7ppm)	Attainment
PM_{10}	Unclassified/ Attainment	Nonattainment	Unclassified/ Attainment	Nonattainment
$PM_{2.5}$	Unclassified/ Attainment	Nonattainment	Unclassified/ Attainment	Nonattainment

[1]Previously in nonattainment; no longer subject to the 1-hour standard due to EPA revocation of the 1-hour standard on June 15, 2005.

[2]ARB approved the 8-hour ozone standard on April 28, 2005, which became effective on May 17, 2006. However, ARB has not yet designated areas for this standard.

Sources: California Air Resources Board, 2007c; U.S. Environmental Protection Agency, 2007b.

3.12.1.3 Criteria Pollutants and Local Air Quality

The federal and state governments have established ambient air quality standards for six criteria pollutants: O_3, CO, NO_2, SO_2, particulate matter, and lead. Ozone and NO_2 are generally considered to be regional pollutants, as these pollutants and their precursors affect air quality on a regional scale. Pollutants such as CO, SO_2, and lead are considered to be local pollutants that tend to accumulate in the air locally. Particulate matter is considered to be a localized pollutant as well as a regional pollutant. In the area where the proposed action is located, O_3, CO, and particulate matter are of particular concern. Brief descriptions of these pollutants are provided below.

Ozone. Ozone is a respiratory irritant and an oxidant that increases susceptibility to respiratory infections and can cause substantial damage to vegetation and other materials. Ozone is a severe eye, nose, and throat irritant. Ozone also attacks synthetic rubber, textiles, plants, and other materials and causes extensive damage to plants by leaf discoloration and cell damage.

Ozone is not emitted directly into the air but is formed by a photochemical reaction in the atmosphere. Ozone precursors, which include reactive organic gases (ROGs)/volatile organic compounds (VOCs), and oxides of nitrogen (NO_X), react in the atmosphere in the presence of sunlight to form ozone. Because photochemical reaction rates depend on the intensity of ultraviolet light and air temperature, ozone is primarily a summer air pollution problem. The ozone precursors ROG/VOC and NO_X are emitted by mobile sources and by stationary combustion equipment.

State and federal standards for ozone have been set for an 8-hour averaging time. The state 8-hour standard is 0.070 ppm, not to be exceeded, while the federal 8-hour standard is 0.08 ppm, not to be exceeded more than three times in any 3-year period. The state has established a 1-hour ozone standard of 0.09 ppm, not to be exceeded.

Carbon Monoxide. CO is essentially inert to plants and materials but can have significant effects on human health. CO is a public health concern because it combines readily with hemoglobin and thus reduces the amount of oxygen transported in the bloodstream. Effects on humans range from slight headaches to nausea to death.

Motor vehicles are the dominant source of CO emissions in most areas. High CO levels develop primarily during winter when periods of light winds combine with the formation of ground-level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. Motor vehicles also exhibit increased CO emission rates at low air temperatures.

State and federal CO standards have been set for both 1- and 8-hour averaging times. The state 1-hour standard is 20 ppm CO by volume, and the federal 1-hour standard is 35 ppm CO. Both state and federal standards are 9 ppm CO for the 8-hour averaging period.

Inhalable Particulate Matter. Particulate matter can damage human health and retard plant growth. Health concerns associated with suspended particulate matter focus on those particles small enough to reach the lungs when inhaled. Particulates also reduce visibility and corrode materials.

The state and federal ambient air quality standard for particulate matter applies to two classes of particulates: PM_{10} and $PM_{2.5}$. PM_{10} is the fraction of particulate matter in the air that has a diameter of 10 micrometers or less. $PM_{2.5}$ is a subset of PM_{10} and includes fine particulate matter that has a diameter of 2.5 micrometer or less.

- The state PM_{10} standards are 50 micrograms per cubic meter ($\mu g/m^3$) as a 24-hour average and 20 $\mu g/m^3$ as an annual arithmetic mean. The state $PM_{2.5}$ standard is 12 $\mu g/m^3$ as an annual arithmetic mean.
- The federal PM_{10} standard is 150 $\mu g/m^3$ as a 24-hour average. The federal $PM_{2.5}$ standards are 15 $\mu g/m^3$ for the annual average and 35 $\mu g/m^3$ for the 24-hour average.

Toxic Air Contaminants. Toxic air contaminants (TACs) are pollutants that may be expected to result in an increase in mortality or serious illness or that may pose a present or potential hazard to human health. Health effects of TACs include cancer, birth defects, neurological damage, damage to the body's natural defense system, and diseases that lead to death. ARB has identified diesel exhaust particulate matter as a TAC.

3.12.1.4 Sensitive Receptors

BAAQMD generally defines a sensitive receptor as a facility or land use that houses or attracts members of the population who are particularly sensitive to the effects of air pollutants, such as children, the elderly, and people with illnesses. Examples of sensitive receptors include schools, hospitals, convalescent facilities, and residential areas. Sensitive receptors located in the vicinity of the proposed action area include residential subdivisions located west of the proposed action area.

Section 3.13

Noise

The following discussion provides background information on noise terminology and describes the existing environment in terms of sensitive receptors, and existing noise levels.

3.13.1 Noise Concepts and Terminology

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air. Noise can be defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level is the most common descriptor used to characterize the loudness of an ambient sound level. The decibel (dB) scale is used to quantify sound intensity. Because sound pressure can vary enormously within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level. The human ear is not equally sensitive to all frequencies in the entire spectrum, so noise measurements are weighted more heavily for frequencies to which humans are sensitive in a process called “A-weighting,” written “dBA.” In general, human sound perception 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 sound level.

Different types of measurements are used to characterize the time-varying nature of sound. These measurements include the equivalent sound level (L_{eq}), the minimum and maximum sound levels (L_{min} and L_{max}), percentile-exceeded sound levels (L_{xx}), the day-night sound level (L_{dn}), and the community noise equivalent level (CNEL). Below are brief definitions of these measurements and other terminology used in this section:

- **Sound.** A vibratory disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is 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.
- **Ambient Noise.** The composite of noise from all sources near and far in a given environment exclusive of particular noise sources to be measured.
- **Decibel (dB).** A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
- **A-Weighted Decibel (dBA).** An overall frequency-weighted sound level in decibels which approximates the frequency response of the human ear.

- **Equivalent Sound Level (L_{eq}).** The average of sound energy occurring over a specified period. In effect, L_{eq} is the steady-state sound level that in a stated period would contain the same acoustical energy as the time-varying sound that actually occurs during the same period.
- **Exceedance Sound Level (L_{xx}).** The sound level is exceeded some percent of the time during a sound level measurement period. For example L_{90} is the sound level exceeded 90% of the time and L_{10} is the sound level exceeded 10% of the time.
- **Maximum and Minimum Sound Levels (L_{max} and L_{min}).** The maximum or minimum sound level measured during a measurement period.
- **Day-Night Level (L_{dn}).** The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.
- **Community Noise Equivalent Level (CNEL).** The energy average of the A-weighted sound levels occurring during a 24-hour period with 5 dB added to the A-weighted sound levels occurring during the period from 7:00 p.m. to 10:00 p.m. and 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.

L_{dn} and CNEL values rarely differ by more than 1 dB. As a matter of practice, L_{dn} and CNEL values are considered to be equivalent and are treated as such in this assessment.

3.13.2 Existing Conditions

Existing conditions information was compiled by reviewing relevant technical reports, including the HWRP SEIS/EIR and the BMKV SEIS/EIR.

3.13.2.1 Site-Specific Noise Conditions

Ambient sound levels associated with noise-sensitive land uses in the vicinity of the proposed action and alternatives vary depending on the proximity of major existing noise sources such as traffic, aircraft, and industrial uses. Ambient sound levels in similar suburban/rural settings are typically in the range of 40 to 60 dBA. Noise levels were measured in 1991 as part of the 1993 EIR/EIS prepared for the prior proposed development at the BMKV site (Table 3.13-1). Development in the vicinity of the Bel Marin Keys Community has not changed substantially since 1991, while a new residential neighborhood has been planned and constructed on the HAAF site to the southwest. Development of the new neighborhood is not considered to result in a substantial change in the ambient noise environment, so the measurements recorded in 1991 are considered to reasonably represent the ambient noise levels present in the project area.

Table 3.13-1. Measured Noise Levels at Selected Locations in the Adjacent BMKV Area

Location	Duration (hours)	L_{eq} (dBA)	L_{max} (dBA)
Center of BMKV	0.25	48	62
Eastern Tip of BMK III	0.25	47	58
Entrance to Site (50 feet from BMK Blvd.)	0.30	55	74
Southern property boundary (HAAF/BMKV)	24	52	80
Source: Environmental Science Associates, 1993			

Noise-Sensitive Land Uses

Noise-sensitive land uses are generally defined as locations where people reside or where the presence of noise could adversely affect the use of the area. Typical noise-sensitive uses include residences, schools, hospitals, and parks. Recreational boating and other activities found in the project area are not considered to be noise-sensitive uses because these activities inherently generate engine, wind, and wave noise which will typically mask noise from project-related activities. In addition, these activities are transitory in nature, which will limit the time that boaters would be exposed to project-related noise.

People recreating along the China Camp shoreline, McNears beach, Pinole Point shoreline, and adjacent recreational piers, however, are considered to be noise sensitive. Walkers, hikers, picnickers, and beach-goers at shoreline parks generally expect a quieter outdoor setting than boaters. As such, these shoreline areas are considered to be noise-sensitive use areas.

Noise-sensitive land uses in the project area that could be affected by the proposed action and alternatives include residential subdivisions and recreational areas along the shoreline. All of these uses are located at least 2.0 mi (about 3.2 km) from the proposed project area, except for the Bel Marin Keys Community, which is located approximately 1.0 mi (about 1.6 km) from the site of the BMKV basin proposed under Alternative 4.

Section 3.14
Aesthetics

3.14.1 Concepts and Terminology

3.14.1.1 Visual Character

Both natural and artificial landscape features make up the *character* of a view. Character is influenced by geologic, hydrologic, botanical, wildlife, recreational, and urban features. Urban features include those associated with landscape settlement and development, such as roads, utilities, structures, earthworks, and the results of other human activities. The perception of visual character can vary significantly among viewers depending on their level of *sensitivity* (interest). Among *sensitive* viewers, perception can vary seasonally and even hourly as weather, light, shadow, and the elements that compose the viewshed change. Form, line, color, and texture are the basic components used to describe visual character and quality for most visual assessments (U.S. Forest Service [USFS], 1974; Federal Highway Administration [FHWA], 1983). The appearance of the viewshed is described in terms of the dominance of each of these components.

3.14.1.2 Visual Quality

Visual *quality* is evaluated using the well-established approach to visual analysis adopted by FHWA, employing the concepts of vividness, intactness, and unity (Jones et al., 1975; FHWA, 1983), as defined below:

- *Vividness* is the visual power or memorability of landscape components as they combine in striking or 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, as well as 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 artificial 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.

3.14.1.3 Visual Sensitivity and Viewer Response

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

The criteria for identifying importance of views are related in part to the position of the viewer relative to the resource. An area of the landscape that is visible from a particular location (e.g., an overlook) or series of points (e.g., a road or trail) is defined as a *viewshed*. To identify the importance of views of a resource, a viewshed may 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 is its importance to the viewer. Although distance zones in viewsheds may vary between different geographic regions or types of terrain, a commonly used set of criteria identifies the *foreground* zone as 0.25 to 0.5 mi from the viewer, the *middleground* zone as extending from the foreground zone to 3 to 5 mi from the viewer, and the *background* zone as extending from the middleground zone to infinity (USFS, 1974).

Judgments of visual quality and viewer response must be made based in a regional frame of reference (U.S. Soil Conservation Service [USSCS], 1978). The same type of visual resource 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 in a flat landscape but have very little significance in mountainous terrain.

Generally, visual sensitivity is 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 1974; USSCS, 1978; FHWA, 1983). Commuters and nonrecreational travelers have generally fleeting views and tend to focus on commute traffic and not on surrounding scenery, and therefore 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 generally are considered to have moderate to high visual sensitivity. Viewers using recreation trails and areas, scenic highways, and scenic overlooks are usually assessed as having high visual sensitivity.

3.14.2 Existing Conditions

Assessment of visual resource impacts involves views of, toward, and from adjacent landforms and open water locations in the Bay. Existing conditions information was compiled by reviewing relevant technical reports, conducting field surveys to ascertain views from adjacent lands, and developing visual simulations of the proposed ATF from multiple vantage points. Photo-documentation was used to capture representative views of and from adjacent lands from site visits conducted in May and June 2007, and May 2008. Photo-documentation of a view from the Bel Marin Keys community was taken in May 2008.

3.14.2.1 Regional Character

The proposed ATF site is located in the middle of the southern part of San Pablo Bay, just inside the Marin County border. Marin, Sonoma, Solano, and Contra Costa counties surround San Pablo Bay. The greater San Francisco Bay region is a complex system of mountain ranges, valleys, and waterways which together create areas that are unique and not only define the character of the region, but contribute to the overall character of California. Some of these notable areas include the wine country of the Napa and Sonoma Valleys, the distinctive urban center of San Francisco, and the vertical cliffs of the Marin Headlands' Pacific coastline. In addition, the region is characterized by panoramic views from the Berkeley/Oakland hills, Mt. Tamalpais and the Marin Headlands, and other topographic features. Rolling hillside vistas throughout the region range from bright green annual grasslands with wildflowers in the spring to golden brown grasslands with valley oaks in the summer and fall. The San Francisco Estuary and numerous waterways are traversed by vessels, ranging from large tankers to small sailboats. Navigable waterways that flow into San Pablo Bay include the Carquinez Strait, Napa River, Petaluma River, Sonoma Creek, Novato Creek, and Gallinas Creek.

The region is characterized by a mix of industrial, commercial, residential, agricultural, and public open space uses. Waterfront industry is an established element in this setting and, locally, includes oil refineries in Hercules, Martinez, Benicia, and Richmond. Container yards, cranes, docks, and old pilings are a prevalent visual element throughout the Bay, especially in the Carquinez Straight to the east, the shores of the City of Richmond to the southeast, and at Port Sonoma at the mouth of the Petaluma River to the northwest.

The 4-mi-long Richmond–San Rafael Bridge connects Contra Costa County southeast of the site to Marin County southwest of the site. The region's public open space areas include Point Pinole Regional Park, Alvarado Park, Wildcat Canyon Regional Park, and Charles Lee Tilden Regional Park to the east, and McNears Beach Park, China Camp State Park, San Pedro Mountain Preserve, and the Golden Gate National Recreation Area to the west. Major waterways in the region include the Pacific Ocean; Suisun, Grizzly, San Pablo, San Rafael, and San Francisco bays; Sacramento, San Joaquin, Napa, and Petaluma rivers; Mare Island and Carquinez straits; and numerous other sloughs, creeks, and tidally influenced waterways of the Estuary.

3.14.2.2 Site-Specific Character

The project site is in the southern portion of San Pablo Bay where water depths are generally -28 feet MLLW or deeper. Approximately 90 square mi of San Pablo Bay's surface area surround the site with three primary peninsulas of land closest to the site on the east, south, and west. The three primary peninsulas of land and their respective associated cities and counties are listed in Table 3.14-1 below.

Table 3.14-1. Project Area Peninsulas and Associated Cities and Counties

Landscape Feature	Distance from site (mi)	Direction from site	City	County
Point Pinole	2.6	East	Richmond	Contra Costa
Point San Pablo	3.0	Southeast	Richmond	Contra Costa
Point San Pedro	2.2	Southwest	San Rafael	Marin

Large commercial boats that can be seen around the project vicinity include tugs, government vessels, container barges, oil tankers, and passenger ferry ships. Passenger ferry ships running through San Pablo Bay are both single and dual hull. The Vallejo Baylink Ferry and the Blue and Gold Fleet are the two primary operators southeast of the project site in the Pinole Shoal Channel.

Recreational sailing boats and yachts, commercial and sport fishing boats, and personal watercraft such as jet skis, kayaks, and boardsails can be seen within the project vicinity coming from the various marinas in the area, including: the Richmond Yacht Harbor and other smaller marinas in Point Richmond to the east, San Pablo Yacht Harbor on Point San Pablo to the south, and the Loch Lomond Marina in San Rafael to the west. Especially on weekends and holidays, regional residents can be seen at boat launches in Marin County to the west at Bucks Landing on Gallinas Creek and Loch Lomond Marina in San Rafael Bay.

Fishing vessels in the project vicinity are commonly seen in the Pinole Shoal Channel southeast of the site, the eel grass beds south of the site, around Point San Pedro west of the site, and in the sturgeon triangle along the northwest boundary of the project area. Popular nearby destinations for recreational boaters include: Point Pinole Regional Shoreline to the east; Gallinas Creek, China Camp State Park, and McNears Beach County Park to the west; and San Pablo Bay Wildlife Area to the northwest.

3.14.2.3 Project Area and Key Viewpoints

Views of Project Site

The off-loader facility (Alternative 1), the proposed ATF site (Alternatives 2 – 3) and the direct channel (Alternative 4) can be seen both from water and from land. These include views from San Pablo Bay itself, as well as views from Point Pinole, Point San Pablo, and Point San Pedro. Figure 3.14-1 shows an oblique view of the project area. Figure 3.14-2 shows the nearest viewing points to the proposed ATF site.

The onshore BMKV basin (Alternative 4) would not be visible from San Pablo Bay due to an intervening levee on the BMKV site. The onshore BMKV basin would be visible, however, from certain portions of the Bel Marin Keys community. Figure 3.14-3 shows photograph of existing views from the Bel Marin Keys community.

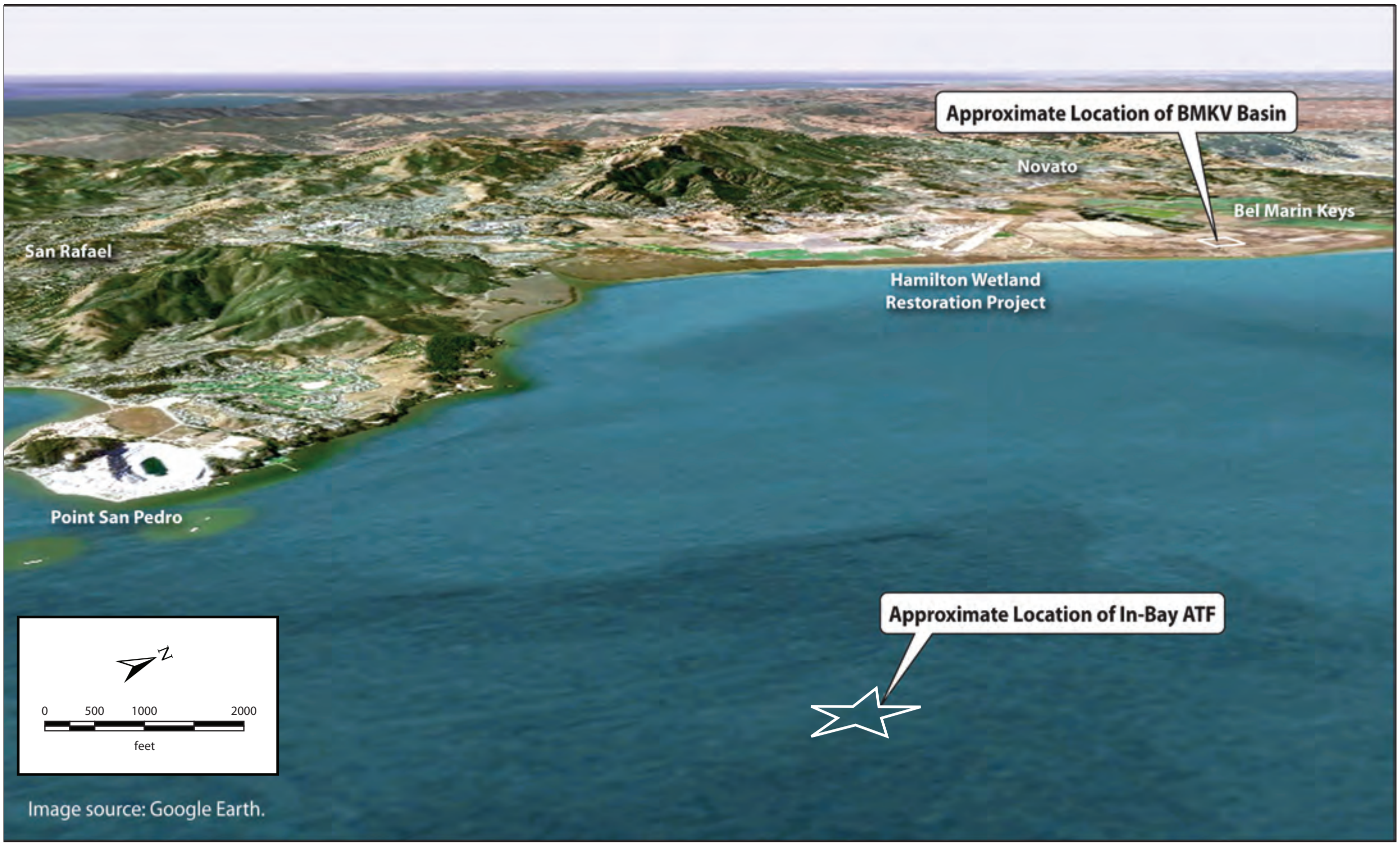
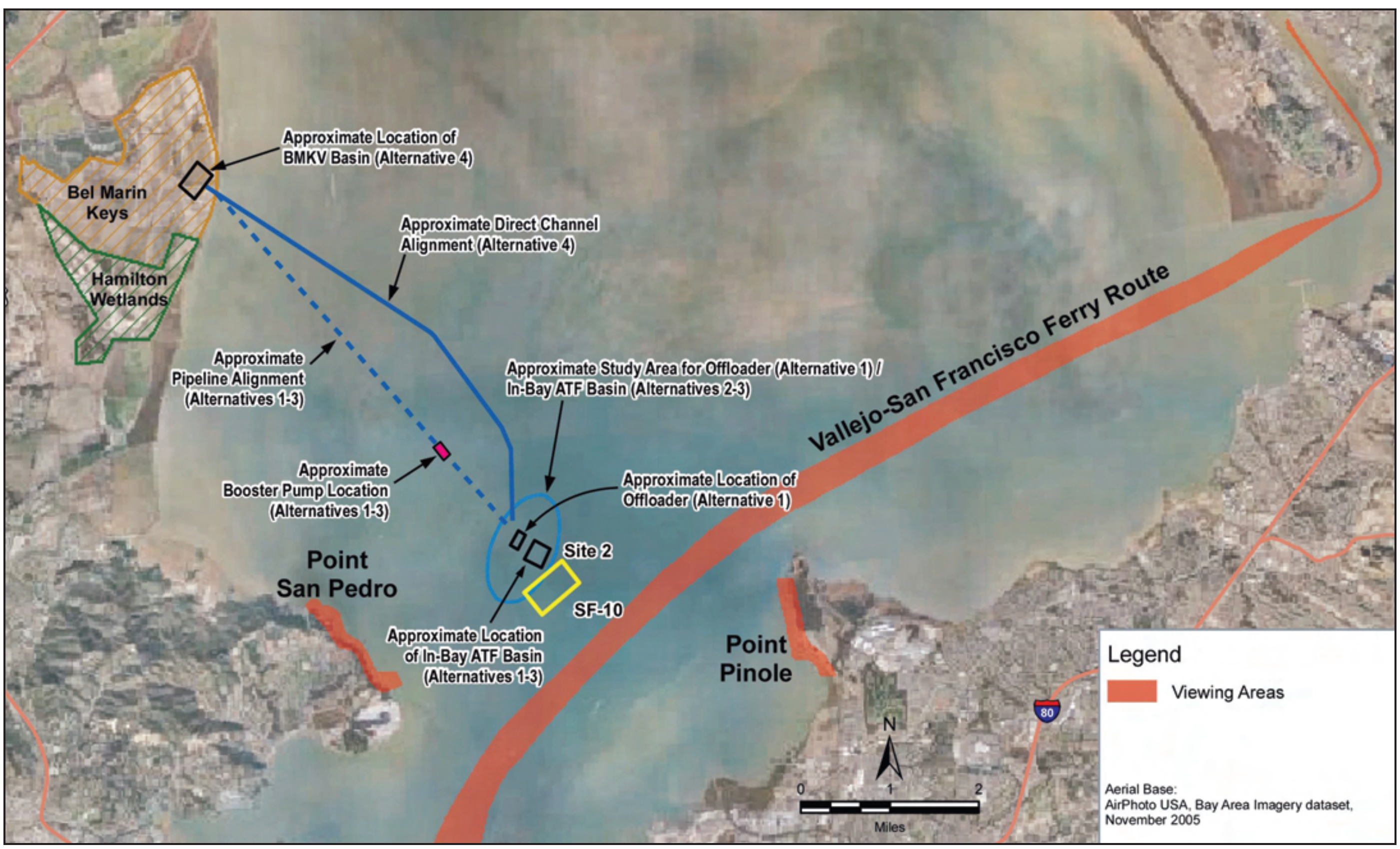


Figure 3.14-1
General Location of In-Bay ATF and BMKV Basin



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ICF Jones & Stokes
an ICF International Company

Figure 3.14-2
Nearest Viewing Points to Offloader/In-Bay ATF

05614.05 (rev.9-08)

ICF Jones & Stokes
an ICF International Company

Figure 3.14-3
Existing View from Bahama Reef in Bel Marin Keys

From Ferry Routes (Vallejo to San Francisco). The Blue and Gold Fleet and Baylink ferries primarily carry commuters from the Vallejo ferry terminal through the Carquinez and San Pablo straits to San Francisco. Each trip takes about an hour. Points of interest seen on a ferry ride include the Carquinez Bridge, China Camp State Park, East Brother Light Station, Richmond Bridge, Angel Island, Golden Gate Bridge, Alcatraz Island, and the San Francisco Ferry Building. Both companies have daily schedules offering 14 scheduled trips each weekday and 9 trips on weekends and holidays (Baylink, 2006; Blue & Gold Fleet, 2006).

The project area is located approximately 0.5 mi northwest of the ferry route and is visible as the ferry traverses between Vallejo and San Francisco. Views from the ferry vary based on its location within the Bay, from highly industrialized areas to distinctive natural areas. Views from the ferry include wide open expanses across San Pablo and San Francisco Bays as well as the narrow San Pablo Straight, where the two Brothers Islands and two Sisters Islands provide visual interest. Middleground views of the Marin coastline range from densely wooded residential hillsides and protected open space to the McNear's Brickyard and San Rafael Rock Quarry industrial facilities. Middleground views of the Contra Costa shoreline also range from protected open space and oak woodlands to the Chevron Richmond Refinery and Tosco-Rodeo Oil Refinery industrial facilities. Background views of the Marin and Sonoma shorelines are generally vegetated and indistinctive (showing few human elements or landmarks), while background views of the Contra Costa shoreline is a mix of residential and industrial landscapes. Near the Vallejo ferry terminal, views of the Carquinez Straight and Mare Island are dominated by oil tanks, cranes, docks and pilings, warehouses and hangers, and other human elements. Near the San Francisco ferry building, views include the San Francisco skyline and the looming San Francisco–Oakland Bay Bridge. The locations of the key photographic and photo simulation viewpoints, and the existing views from the ferry route are shown in Figures 3.14-4 and 3.14-5, respectively.

Views occurring before, during, or after dawn or dusk may be especially distinctive with the changing sunlight and early morning or nighttime lights surrounding the Bay and on surrounding boats. Because of the wide variation in the visual character across the Bay, visual quality varies from moderately low to moderately high.

From Point San Pedro. The sun-bleached rocks of San Pedro Hill stand out at the tip of Point San Pedro, approximately 2.2 mi southwest of the project site. To the north, stretching along about 0.3 mi of shoreline, McNears Beach Park's sand and green lawns are framed by the rich forest vegetation of Marin County. Within the park, a fishing pier extends about 500 feet toward the project site, providing the closest public views of the site. In the hillside above and to the north, about 9 large single-family residences have prominent views of the project site amidst the rich forest vegetation. Winding northward along the shoreline hills of China Camp State Park, the scenic Point San Pedro Road provides occasional glimpses of San Pablo Bay through the park's dense vegetation. China Camp State Park extends about 2.6 mi along the shoreline ending at the mouth of Gallinas Creek, which includes Gallinas Beach and a boat launch approximately 4.8 mi from the project site. The locations of the key photographic and photo simulation viewpoints, and the existing views from Point San Pedro are shown in Figures 3.14-6 and 3.14-7, respectively.

From Point San Pedro, views of the project site include the Point Pinole Regional Park in the middleground and the Contra Costa County shoreline, comprised of mixed residential and industrial development, in the background. About 11 mi away, the barely visible shores of Solano County frame the far end of San Pablo Bay to the north. Views of San Pablo Bay are expansive and the Bay Area's characteristic topography appears rather stunted. Even large container barges and passenger ferries appear rather small when viewed across the vastness of the Bay. In the foreground, small wooden structures, docks and abandoned pilings, and industrial equipment associated with the San Rafael Rock Quarry are set against the rugged shoreline, vegetated cliffs, oak woodlands, and mudflats of China Camp State Park. The contrast between the rocky shoreline and the vast expanse of the Bay lends vividness and interest to the views.

Nighttime views of the project site include the predominantly industrial lights of the City of Richmond to the east, with the exception of the nearest point of Point Pinole Regional Park's natural setting to the immediate right. Lights in Solano County may be faintly seen in the distant background, and boat lights are common throughout the middle- and foreground of San Pablo Bay. The vividness, intactness, and unity range from moderate to moderately high from these vantages. Human-made elements are present and contribute to the variety and interest in views of the Bay and coastline.

From Point Pinole. Point Pinole Regional Park has 2,315 ac of public parkland and more than 12 mi of trails, with a nearly 0.25-mi-long pier at the end of the point. The park is open from 5 a.m. to 10 p.m. unless otherwise posted (East Bay Regional Park District 2006). The project site can be seen with moderate clarity from the Bay View Trail that is close to and follows along the park's western shoreline. The park contains grasslands, Eucalyptus groves, and beaches. Views across the Bay include Mt. Tamalpais beyond and to the left of the project site, with other smaller Marin County coastal hills along the skyline view. Views to the south include the Chevron Richmond Refinery and other industrial facilities, undeveloped slopes, and some residential development. The locations of the key photographic and photo simulation viewpoints, and the existing views from Point Pinole are shown in Figures 3.14-8 and 3.14-9, respectively.

Immediately south of the park, Parchester Village, a cluster of 400 single-family homes, contains close to a 0.4-mi–long expanse of residences facing the project site across the Amtrak Capitol Corridor Train tracks. Further south, views of the site are primarily from industrial uses along the coast toward Point San Pablo, which is immediately south of the project site. Permanent nighttime lights are visible in the background along Marin County's shoreline, with more diminished views of the Sonoma County shoreline to the north.

Transitory views of boat lights are common in the middle- and foreground. These lights illuminate the night sky with ambient light and reflect onto the water's surface, creating a potential source of nighttime glare. The visual quality is generally moderate to moderately high from these vantages because the features in the viewshed are often vivid in character, and the natural and human-built landscapes are interesting and complex. However, human-made elements are notably present and detract from views of the coastline.

From Point San Pablo. Chevron owns most of the land on Point San Pablo. To the north of the peninsula, the privately owned Point San Pablo Yacht Harbor has about 200 berths and a small restaurant. The harbor mainly includes fishing boats and houseboats with some sport and sail boats. From the harbor, a panorama view of San Pablo Bay extends for miles, with the northern shores of Sonoma and Napa County visible in the distant background. The City of Richmond's industrial area lines the coast to the east. To the south, the Point San Pablo ridgeline shields the view with a Coast Guard weather station at the top of the ridge, as well as communication towers, the main road, and some overhead utility lines at the shore. Three white storage tanks crown the peninsula's ridge as part of Terminal 4, directly west of the harbor. To the northwest about 2.2 mi across the San Pablo Strait are the excavated white rocks of San Pedro Hill with various hills of Marin County beyond.

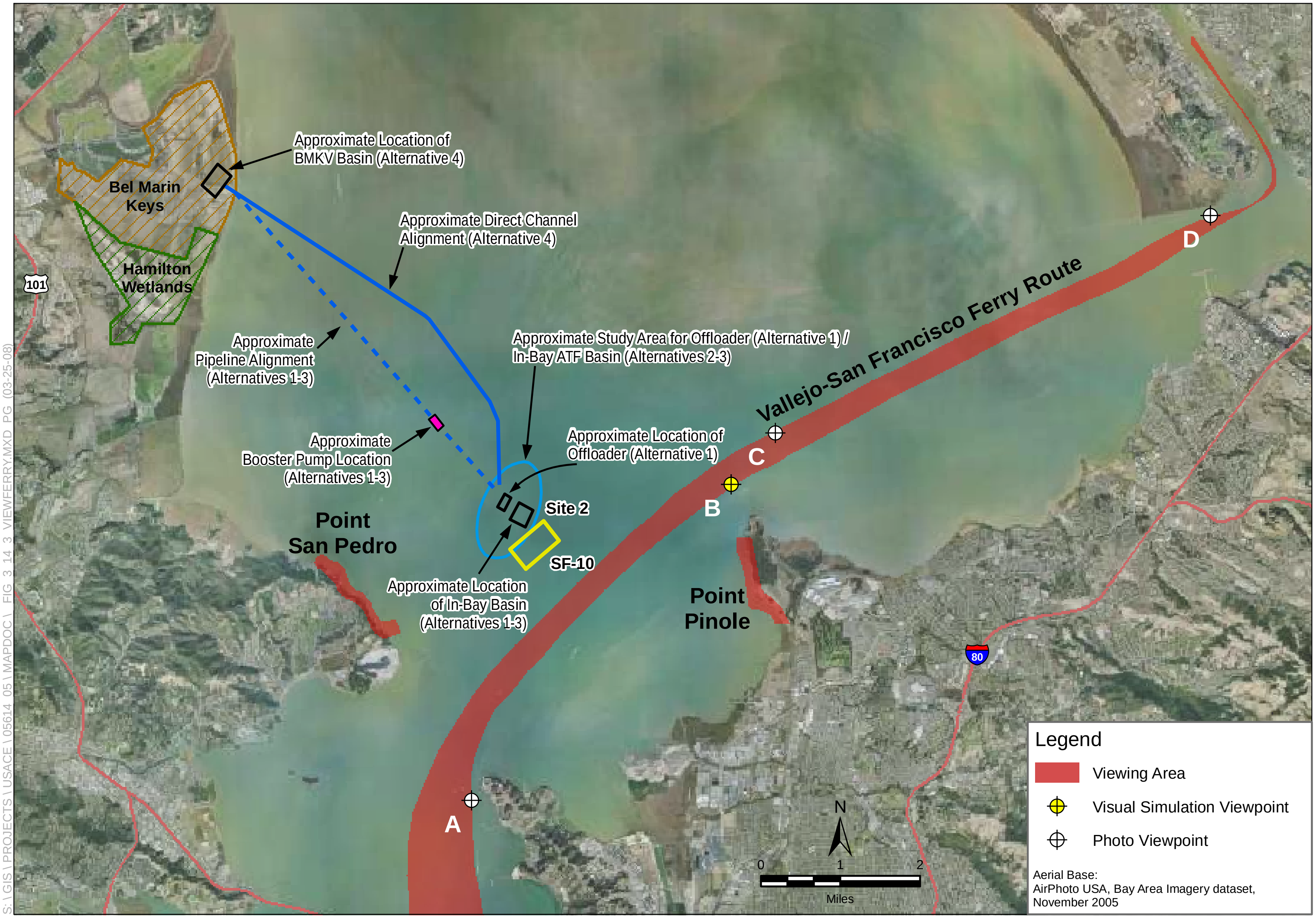

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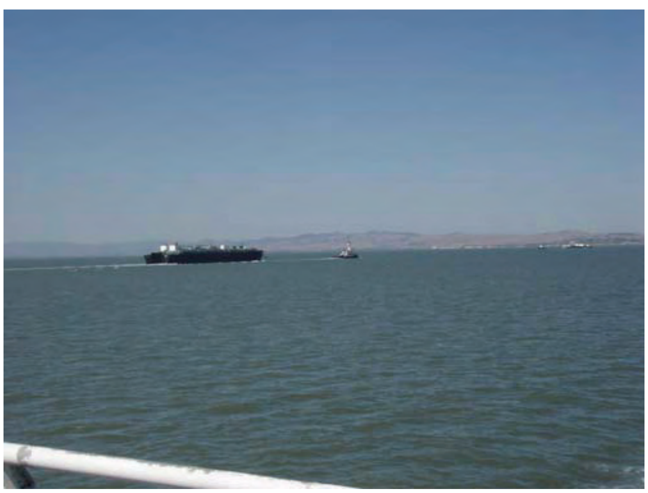
Figure 3.14-4
Photo Viewpoints from the Vallejo-San Francisco Ferry

A. View looking north toward the Sisters

B. View looking west toward Loma Alta (Marin County)



C. View looking north across San Pablo Bay (Sonoma County)

D. View looking east toward Carquinez Bridge

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Figure 3.14-5
Existing Views from the Vallejo-San Francisco Ferry

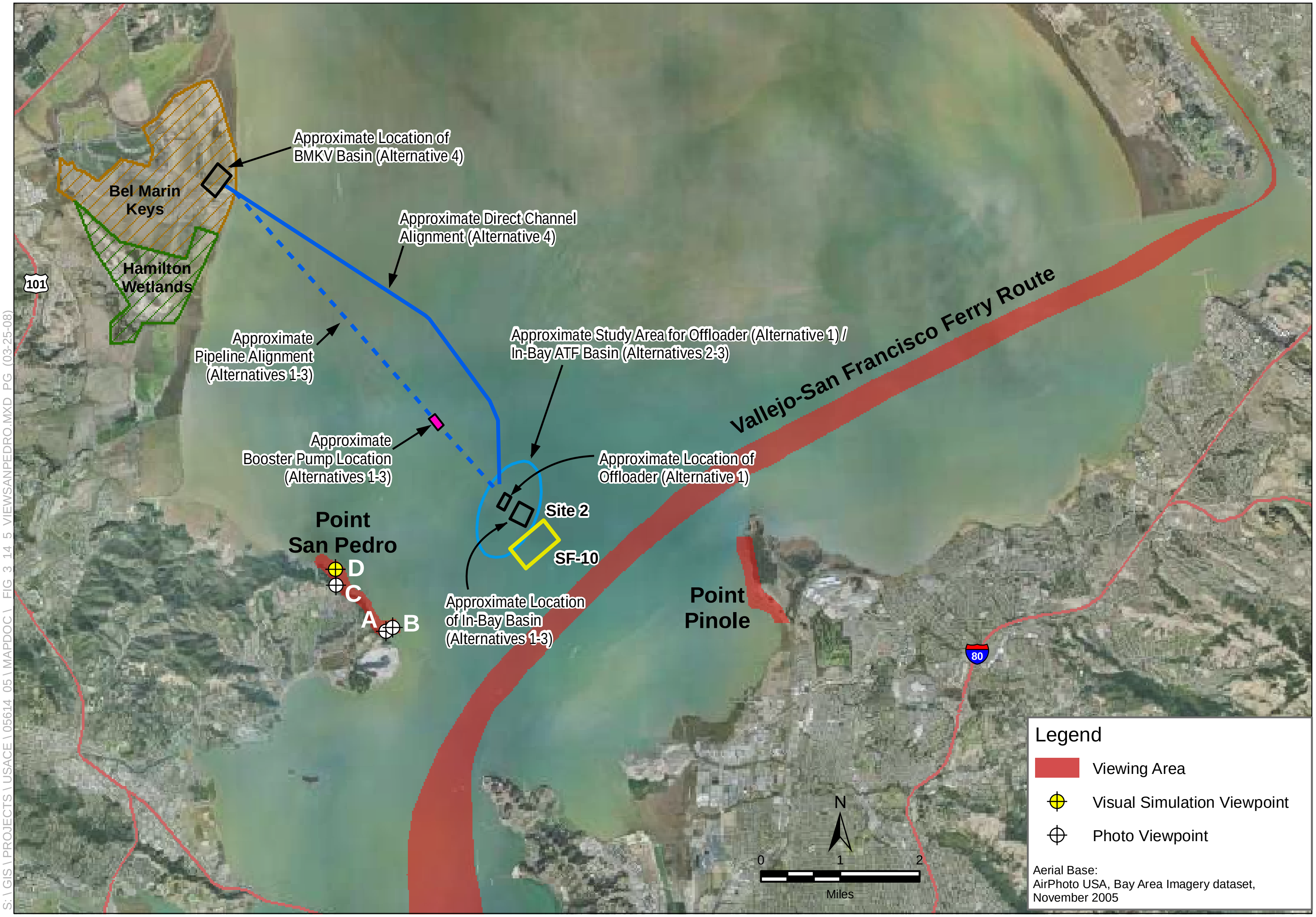

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Figure 3.14-6
Photo Viewpoints from Point San Pedro

A. View looking south toward Point San Pedro

B. View looking southeast toward Point San Pablo (from Fishing Pier)

C. View looking northeast across San Pablo Bay

D. View looking southeast toward Point Pinole

Figure 3.14-7
Existing Views from Point San Pedro

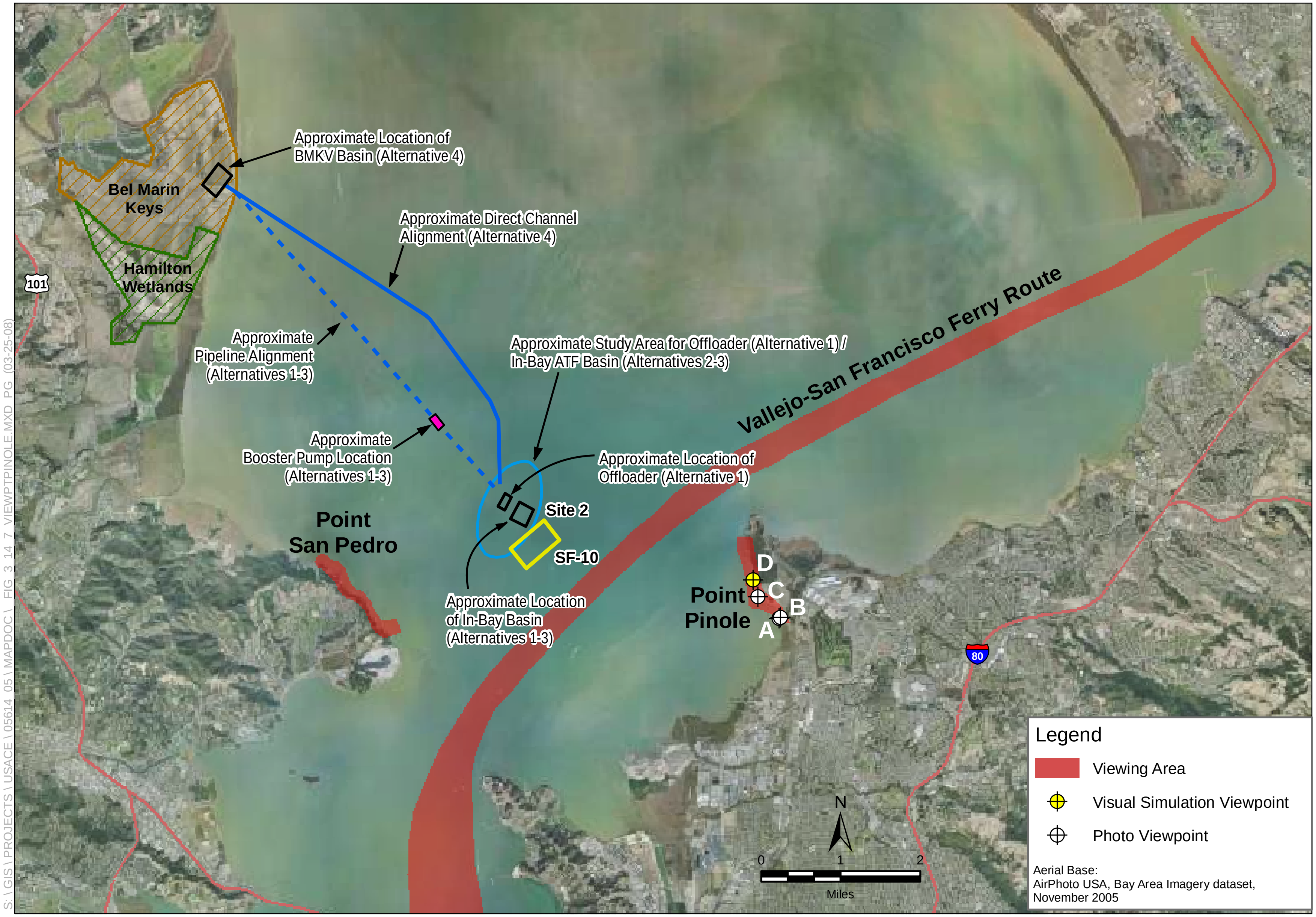

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Figure 3.14-8
Photo Viewpoints from Point Pinole

A. View looking southeast toward the City of Richmond

B. View looking north toward Point Pinole

C. View looking west toward San Pablo Strait

D. View looking west across San Pablo Bay (Marin County)

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Figure 3.14-9
Existing Views from Point Pinole

The City of Richmond owns Terminal 4, which has a gross area of 43 ac at the north end of the peninsula and was used as a tank farm and bulk liquid terminal until 2001. Western Drive rounds the north point of the peninsula. Approximately 1,000 feet offshore to the west of the point are the two Brothers Islands. The larger East Brother Island was the site of a Coast Guard lighthouse station. Today, the 1-ac East Brother Light Station is a picturesque commercial bed and breakfast and is listed on the National Register of Historic Places (LSA Associates, 2005). Views from the point are framed by Point San Pedro to the west and Point Pinole to the east, with commercial and recreational boats often appearing throughout San Pablo Bay to the north. The project site is fairly visible on clear days 3 mi to the north.

Nighttime lights are visible on Point San Pedro 2 mi away to the west and on Point Pinole 4 mi away to the east, with boat lights common in the middleground and foreground. The vividness, intactness, and unity are generally moderate to moderately high from these vantages. However, human-made elements are notably present and detract from views of the Bay and coastline. Additionally, the quality of views from this vantage point is surpassed by the higher quality views that are present from the Point San Pedro and Point Pinole vantage points.

From Bel Marin Keys. Views of San Pablo Bay are present from Bahama Reef within the existing Bel Marin Keys community. While visual impacts on this viewpoint were evaluated in the BMKV SEIS/EIR, an updated photograph was taken from this location for the proposed project since Alternative 4 facilities could be visible from the end of Bahama Reef (see Figure 3.14-3). This viewshed faces east towards San Pablo Bay and consists of the south lagoon in the foreground and flat, vegetated land in the middle ground. Views from this viewpoint are generally clear and mostly unobstructed by utilities (except for an above-ground power pole) or other physical structures. San Pablo Bay is a small portion of the background view from street level but is prominent from the second-story level. The view of San Pablo Bay is partially obstructed by the existing outboard levee. Nighttime lights are visible both on the water and across San Pablo Bay. Human-made elements are notably present in the background views of the Bay.

3.14.2.4 Viewer Groups and Viewer Responses

Viewer groups in the vicinity of the project area and their sensitivity to visual changes in the area are characterized below.

Recreational Users

Recreational users view the project site from watercraft throughout San Pablo Bay as well as from Point Pinole Regional Park, Point San Pablo Yacht Harbor and restaurant, the East Brother Light Station, McNears Beach Park, China Camp State Park, and Gallinas Beach. Waterway users throughout San Pablo Bay have differing views, based on their location in the viewshed, and are accustomed to variations in the level of industrial, commercial, and recreational activities in the vicinity of the project area.

Users of Point Pinole Regional Park, McNears Beach Park, China Camp State Park, and Gallinas Beach are likely to seek out sweeping views of the Bay and natural areas along the shoreline from hiking, biking, and jogging trails, fishing piers, beaches, and the pool and tennis courts at McNears

Beach Park. Visitors to the Point San Pablo Yacht Harbor and its small restaurant and the East Brother Light Station are also likely to seek out sweeping views of the Bay and natural areas along the shoreline in these more formal settings. Viewer sensitivity is moderately high among these recreationists because they are more likely to value the natural environment highly, appreciate the visual experience, and be more sensitive to changes in views.

Residents

Approximately 9 single-family homes are located about 2.4 mi southwest of the project site in the scenic hills of Marin's Point San Pedro. Views of the Bay from these large 2-story residences would be highly valued. Because of their potentially prolonged exposure to such views, distance from the site, and context, these residents are considered to have moderately high sensitivity to changes in the viewshed.

Parchester Village is approximately 3.5 mi southeast of the project site in an industrial area of the City of Richmond's shoreline. However, of the 0.4-mi line of low-end single-family houses with rear yards facing the Bay, most have fences and railroad tracks and some have sheds and vegetation obstructing the views. Therefore, residents of Parchester Village are likely to have low sensitivity to visual changes due to their context, obstructed visibility, and relative distance from the project site.

The Bel Marin Keys community is comprised of approximately 700 single-family homes located along two managed lagoons connected to Novato Creek by two locks. The lagoons provide berthing for private watercraft and boat owners use Novato Creek to access San Pablo Bay. The nearest residential unit to the BMKV basin and associated facilities in Alternative 4 would be just over 1.0 mi. The viewshed of some of these residences include the BMKV restoration site in foreground and middle ground and portions of San Pablo Bay in the background. Because of the distance to the outboard levee (over 1.0 mi) and the construction-related activity that will already be occurring during the restoration effort, it is expected that Bel Marin Keys residents will have low sensitivity to visual changes associated with Alternatives 1–3. However, residents may have a moderate sensitivity to changes due to the construction and operation of the BMKV basin under Alternative 4, which would be in the middle ground and within the viewshed of some of the residences.

An electrical substation that powers the existing off-loader facility and pumps under Alternative 1 is located in the far west corner of the of the BMKV site near Bel Marin Keys Boulevard (see Figure 3.14-10). Power poles and lines extend from this substation along the HWRP perimeter levee, turning south near the outboard levee to a landside booster pump near the offshore pipeline on the HWRP site. Power cables extend along the pipeline out to the offshore booster pump station and the off-loader facility. As part of mitigation under the HWRP, the electrical substation was screened by placement of a mesh screen on the fence and planting of fast-growing shrubs to further provide a living (natural) screen.

Motorists

Motorists 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

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Figure 3.14-10
Existing View of Screened Electric Substation at BMKV Site

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.

Motorists traveling along the Richmond Parkway include commuters, area residents, and recreationists from the region and beyond. Currently, much of the land visible from the parkway is dedicated to residential and industrial uses. However, approximately 1.5 mi of the parkway comes within 2.5 to 0.5 mi of San Pablo Bay and within 3.5 mi of the project site to the northwest. While the area is primarily industrial, motorists traveling at relatively high speeds on the parkway are more likely to be interested in sweeping views of the Bay than in the industrial development they quickly pass.

Motorists are likely to enjoy sporadic scenic views of the Bay through portions of the primarily residential and recreational land along Point San Pedro Road in Marin County. The roadway winds along the shoreline for approximately 0.75 mi, offering occasional glimpses of San Pablo Bay through the park’s dense vegetation. While motorists will drive at moderate speeds, drivers may be more aware of each bend in this portion of the road than passengers.

Viewer sensitivity is moderately low among most roadway travelers anticipated 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 fleetingly aware of surrounding traffic, road signs, their immediate surroundings within the automobile, and other visual features.

Section 3.15

Greenhouse Gas Emissions and Climate Change

3.15.1 Existing Conditions

This environmental setting provides a background on greenhouse gas (GHG) emissions and climate change and specifically U.S., California, and Bay Area GHG emissions.

Greenhouse Gases

Activities such as fossil fuel combustion, deforestation, and other changes in land use result in the accumulation of GHGs such as carbon dioxide (CO_2), in the atmosphere. An increase in GHG emissions results in an increase in the Earth's average surface temperature, which is commonly referred to as *global warming.* Global warming is expected, in turn, to affect weather patterns, average sea level, ocean acidification, chemical reaction rates, precipitation rates, etc. in a manner commonly referred to as *climate change.*

Since the industrial revolution, concentrations of GHGs in the Earth's atmosphere have been gradually increasing. Recently recorded increases in the Earth's average temperature are the result of increased concentrations of GHG in the atmosphere (Intergovernmental Panel on Climate Change 2007).

The Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organization and United Nations Environment Programme to assess scientific, technical, and socioeconomic information relevant to the understanding of climate change and its potential impacts and options for adaptation and mitigation. The IPCC's best estimates are that the average global temperature rise between years 2000 and 2100 could range from 0.6 degrees Celsius (°C) (with no increase in GHG emissions above year 2000 levels) to 4.0°C (with substantial increase in GHG emissions) (Intergovernmental Panel on Climate Change 2007). Large increases in global temperatures could have deleterious impacts to the natural and human environments.

According to the EPA, a GHG is any gas that absorbs infrared radiation in the atmosphere. This absorption traps heat within the atmosphere creating a "greenhouse" effect that is slowly raising global temperatures. GHGs include water vapor, CO_2, methane (CH_4), nitrous oxide (N_2O), halogenated chlorofluorocarbons (HCFCs), ozone (O_3), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs). Naturally occurring GHGs include water vapor, CO_2, CH_4, N_2O, and O_3. Many human activities add to the levels of most of these naturally occurring gases. CO_2 is released to the atmosphere when solid waste, fossil fuels (oil, natural gas, and coal), and wood and wood products are burned. N_2O is emitted during agricultural and industrial activities and during combustion of solid waste and fossil fuels. CO_2 and N_2O are the two GHGs released in greatest quantities from mobile sources burning gasoline and diesel fuel. CH_4, a highly potent GHG, results from off-gassing associated with agricultural practices, livestock, freshwater wetlands, and landfills, among other anthropogenic and natural sources.

Sinks of CO_2[1] (which absorb, rather than produce, CO_2), include uptake by vegetation and dissolution of the gas into planktonic biomass in ocean waters. Worldwide GHG production greatly exceeds the absorption capacity of natural sinks. As a result, concentrations of GHG in the atmosphere are increasing (California Energy Commission 2006).

Climate change is a global problem and GHGs are global pollutants, unlike criteria air pollutants (such as ozone precursors) and TACs, which are pollutants of regional and local concern.

Climate Change Impacts in California

Climate change could impact the natural environment in California in the following ways, among others:

- rising sea levels along the California coastline, particularly in San Francisco Bay and the Sacramento–San Joaquin Delta due to ocean expansion;
- extreme heat conditions, such as heat waves and very high temperatures, which could last longer and become more frequent;
- an increase in heat-related human deaths and infectious diseases and a higher risk of respiratory problems caused by deteriorating air quality;
- reduced snowpack and streamflow in the Sierra Nevada mountains, affecting winter recreation and water supplies;
- potential increase in the severity of winter storms, affecting peak stream flows and flooding;
- changes in growing season conditions that could affect California agriculture, causing variations in crop quality and yield; and
- changes in distribution of plant and wildlife species due to changes in temperature, competition from colonizing species, changes in hydrologic cycles, changes in sea levels, and other climate-related effects.

These changes in California's climate and ecosystems are occurring at a time when California's population is expected to increase from 34 million to 59 million by the year 2040 (California Energy Commission 2005). As such, the number of people potentially affected by climate change and the amount of anthropogenic GHG emissions is expected to significantly increase. Similar changes as those noted above for California also would occur in other parts of the world, with regional variations in resources affected and vulnerability to adverse effects.

[1] A CO_2 sink is a resource that absorbs CO_2 from the atmosphere. The classic example of a sink is a forest in which vegetation absorbs CO_2 and produces O_2 through photosynthesis.

Emissions Summary

United States Greenhouse Gas Emissions

In 2006, total U.S. GHG emissions were 7,054.2 Mmt CO_2 equivalent (CO_2e[2]). Overall, total U.S. emissions have risen by 14.7% from 1990 to 2006. The primary GHG emitted by human activities in the U.S. was CO_2, representing approximately 84.8% of total GHG emissions. The largest source of CO_2 and of overall GHG emissions was fossil fuel combustion. CH_4 emissions, which have declined from 1990 levels, resulted primarily from enteric fermentation associated with domestic livestock, decomposition of wastes in landfills, and natural gas systems. Agricultural soil management and mobile source fossil fuel combustion were the major sources of N_2O emissions. The emissions of substitutes for ozone- depleting substances and emissions of HFC-23 during the production of HCFC-22 were the primary contributors to aggregate HFC emissions. Electrical transmission and distribution systems accounted for most sulfur hexaflouride (SF_6) emissions, while PFC emissions resulted from semiconductor manufacturing and as a by-product of primary aluminum production (U.S. Environmental Protection Agency 2008).

California Emissions

Worldwide, California is estimated to be the 12th to 16th largest emitter of GHG emissions and is responsible for approximately 2% of the world's GHG emissions (California Energy Commission 2006). The California Energy Commission's *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004* estimates that California is the second largest emitter of GHG emissions in the U.S. (only Texas emits more GHG. Transportation is responsible for 41% of the state's GHG emissions, followed by the industrial sector (23%), electricity generation (20%), agriculture and forestry (8%) and other sources (8%). California GHG emissions in 2004 (exclusive of land use changes and forestry) totaled approximately 484 MMT of CO_2e (California Air Resources Board 2007).

Bay Area Greenhouse Gas Emissions

In November 2006, the BAAQMD prepared an inventory of GHG emissions in the nine-county Bay Area. Transportation was responsible for 51% of the Bay Area's emissions, followed by the industrial/commercial sector (26%), power plants (7%), oil refining (6%) and domestic use (11%) (Bay Area Air Quality Management District 2006). Total GHG emissions in 2002 were estimated at 85.4 MMT-CO_2e.

[2] GHG emissions other than CO_2 are commonly converted into CO_2e, which takes into account the differing GWP of different gases. For example, the IPCC finds that N_2O has a GWP of 310 and CH_4 has a GWP of 21. Thus emission of 1 ton of N_2O and 1 ton of CH_4 is represented as the emission of 310 tons of CO_2e and 21 tons of CO_2e, respectively. This allows for the summation of different GHG emissions into a single total.

Chapter 4
Environmental Consequences

This chapter discusses the potential impacts of the proposed action and alternatives on the quality of the human environment pursuant to Section 15126 of CEQA (Title 14 California Code of Regulations [CCR]) and Section 102 (c) of NEPA (42 United States Code [USC] § 4332). This chapter also discusses the mitigation measures that could avoid, minimize, rectify, reduce, eliminate, or compensate for impacts that are considered significant.

Section 4.1

Significance of Environmental Impacts

According to CEQA regulations, an EIR should define the threshold of significance and explain the criteria used to determine whether an impact is above or below that threshold. Significance criteria are identified for each environmental resource to determine whether implementation of the proposed action alternatives would result in a significant environmental impact when evaluated against the baseline conditions set forth in Chapter 3, Affected Environment. The significance criteria vary depending on the environmental resource being evaluated. In some cases a significant impact may be identified as significant and unavoidable if no feasible mitigation measure(s) is/are available to reduce the impact to a less-than-significant level.

NEPA criteria for determining significance are listed in 40 Code of Federal Regulations (CFR) 1508.27, but are considered broader than CEQA criteria. As such, identification of specific impacts as significant under CEQA is treated herein as sufficient for also identifying impacts considered significant under NEPA. Mitigation measures set forth to minimize significant impacts under CEQA are presumed to also mitigate significant impacts under NEPA. These assumptions are made only to identify the magnitude of particular impacts; this document fully complies with both NEPA and CEQA requirements.

Section 4.2

Potential Impacts to Geology and Seismicity

4.2.1 Methodology for Impact Analysis

Potential impacts related to geology and seismicity were analyzed qualitatively, based on a review of the project description, best available data and information for the project area, and the best professional judgment of earth scientists from USACE and Jones & Stokes. Analysis focused on the proposed action's potential to increase the risk of personal injury, loss of life, and damage to property, including project facilities, as a result of existing or reasonably foreseeable geologic and seismic hazards in the project area.

4.2.1.1 Impact Mechanisms

Impact mechanisms considered in this section include those construction-related activities that would substantially alter existing geologic conditions and/or existing geologic and seismic hazards. As described in Section 3.2, it is assumed that the sediment underlying the proposed ATF site is composed of compressible bay mud deposits. However, specific studies have not been conducted in the proposed project area. Therefore, during the design phase of any of the action alternatives (Alternatives 2 through 4), geotechnical investigations, laboratory testing, and environmental sediment sampling and testing will be conducted prior to specific site selection of the ATF basin and access channels. The findings of these studies will facilitate the selection of the ATF basin and development of engineering design criteria. Should findings be contrary to the assumptions and expectations of potential impacts described below, potential impacts to geology and soils will be further evaluated.

4.2.2 Thresholds of Significance

For the purposes of this analysis, an impact was considered to be significant and to require mitigation if it would:

a. Expose people or structures to potential *substantial* adverse effects, including the risk of loss, injury, or death involving:

   1) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;

   2) Strong seismic ground shaking;

   3) Seismic-related ground failure, including liquefaction;

b. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site lateral spreading, subsidence, liquefaction or collapse.

4.2.3 Impacts and Mitigation Measures

The following table summarizes the impacts and the significance determinations for each of the alternatives relative to Geology and Seismicity.

Table 4.2-1. Summary of Geology, Soils, and Seismicity Impacts

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact GSS-1: Substantial Adverse Effects Resulting from Fault Rupture	No Impact	No Impact	No Impact	No Impact
Impact GSS-2: Substantial Adverse Effects Resulting from Strong Seismic Ground Shaking	Less than Significant	Less than Significant	Less than Significant	Less than Significant
Impact GSS-3: Substantial Adverse Effects Resulting from Earthquake-Induced Liquefaction	Less than Significant	Less than Significant	Less than Significant	Less than Significant
Impact GSS-4: Substantial Adverse Effects Resulting from Unstable Geologic Units (Compressible Bay Mud Deposits)	Less than Significant	Less than Significant	Less than Significant	Less than Significant

Impact GSS-1: Substantial Adverse Effects Resulting from Fault Rupture

All Alternatives

There are no active or potentially active project faults located in or immediately adjacent to the project area. Accordingly, under all alternatives, the project area is unlikely to be affected by fault rupture. There would be ***no impact***. No mitigation is required.

Impact GSS-2: Substantial Adverse Effects Resulting from Strong Seismic Ground Shaking

Alternative 1: No Action

The results of the most recent statewide probabilistic seismic hazard assessment published by the California Geological Survey indicate that the project area will likely experience strong seismic ground shaking in the near future.

If the existing off-loader is used, there would be no change from existing conditions.

If the off-loader and booster pump platforms are replaced, they could be either pile-secured or floating. In each case, 3 to 24 piles would be driven into the underlying bay mud to secure the platform. The piles, and the concrete anchors used to secure the transfer pipeline to the bay floor, may be subjected to strong ground motions in the event of a large magnitude earthquake originating on one of the active faults in the vicinity of the project area. To address this concern, the systems used to secure replaced the off-loader and booster pump platforms, and transfer pipeline would be designed in accordance with appropriate seismic considerations to minimize the potential for damage in the event of an earthquake. The Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS) approved by the California Building Standards Commission in 2005 (codified as Chapter 31F [Marine Oil Terminals], Title 24, California Code of Regulations, Part 2, California Building Code) provides relevant seismic criteria for consideration. Since the off-loader is not a marine oil terminal, these standards are not mandatory. Therefore, impact is considered ***less than significant***. No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Under Alternative 2, a floating hydraulic cutterhead dredge head would be used to transfer dredged material from the proposed ATF to the HWRP. Because the hydraulic cutterhead dredge and other dredging equipment used under this alternative are free-floating and would not be secured by piles driven into the bottom of San Pablo Bay, they would not be subject to strong ground shaking in the event of an earthquake on one of the active faults in the project vicinity. Piles associated with the booster pump platform and concrete anchors used to secure the transfer pipeline to the bay floor would both be designed in accordance with appropriate seismic considerations as described under Alternative 1. The side slopes of the proposed ATF could be subject to slope failure under earthquake loading. However, the ATF design would take seismicity into account, and the slopes would be constructed accordingly to be stable under moderate earthquake loads. Therefore, impact is considered ***less than significant***. No mitigation is required.

Alternative 3: Confined In-Bay ATF

Impacts under Alternative 3 would be generally similar to those described for Alternative 2. Under Alternative 3, the perimeter walls surrounding the proposed ATF basin would be constructed of sheet piles. These piles and the associated steel walls may be subjected to strong ground shaking in the event of a large magnitude earthquake originating on one of the active faults in the vicinity of the project area. To address this concern, the confining walls would be designed in accordance with appropriate seismic design standards to minimize the potential for damage in the event of an earthquake. As is the case with Alternative 2, piles associated with the booster pump platform and concrete anchors used to secure the transfer pipeline to the bay floor would also be designed in accordance with appropriate seismic design standards as described for Alternative 1. The design of the confinement structure would also account for Young Bay Mud settlement or, in the worst case scenario—plastic flows— resulting from the stress of the sheet piling. To avoid this potential impact, anchoring the sheet piling into the Old Bay Mud, which is better consolidated and stiffer than the Young Bay Mud would be a reasonable approach since it is better consolidated and stiffer than the Young Bay Mud that overlays it. This impact is considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Under Alternative 4, no new structures would be placed within San Pablo Bay. Although the direct channel and the BMKV basin and its perimeter levee would be subject to strong ground shaking in the event of a large magnitude earthquake, no significant impacts are anticipated. Because this process would not increase the risk of personal injury, loss of life, and damage to property, this impact is considered ***less than significant***. Detailed geotechnical investigations and analyses would be conducted to address levee construction on bay mud at the BMKV site (as noted in the environmental analysis in the BMKV SEIS/EIR). As such, the perimeter levees would be designed in accordance with appropriate seismic design standards. This impact is considered ***less than significant***. No mitigation is required.

Impact GSS-3: Substantial Adverse Effects Resulting from Earthquake-Induced Liquefaction

Alternative 1: No Action

As described above, if replaced, the off-loader and booster pump platforms proposed under Alternative 1 would be either pile-secured or floating. Depending on the selected design, 3 to 24 piles would be driven into the bay mud deposits on the bottom of San Pablo Bay to secure the platform. Additionally, concrete anchors would be used to secure the transfer pipeline that would extend across the bay floor from the off-loader facility to the HWRP site. The most recent liquefaction susceptibility report published by the U.S. Geological Survey indicates that bay mud deposits, such as those that occur at the bottom of San Pablo Bay, are moderately susceptible to liquefaction, suggesting that the support piles, the attached off-loader platform, and the transfer pipeline could be subject to substantial adverse impacts due to liquefaction during an earthquake. To address this concern, the off-loader platform, booster pump platform, and the transfer pipeline would be designed and installed in accordance with standard engineering practices and appropriate seismic design considerations to minimize potential for liquefaction related damage in the event of an earthquake. This impact is considered ***less than significant***. No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Under Alternative 2, a floating hydraulic cutterhead dredge head would be used to transfer dredged material from the proposed ATF to the HWRP. The hydraulic cutterhead dredge and other dredging equipment proposed for use under this alternative are free-floating, and thus would not be secured by driven piles and it would not be affected by liquefaction of San Pablo Bay bottom during an earthquake on one of the active faults in the project vicinity. Similar to Alternative 1, piles associated with the booster pump platform and concrete anchors used to secure the transfer pipeline to the bay floor would both be designed in accordance with appropriate seismic design considerations, which would to minimize the potential for damage due to earthquake induced liquefaction.

The potential for seiche induced by geotechnical failure of the proposed ATF is considered to be minor. For the purposes of evaluating the potential impact under these alternatives, a seiche is a localized sloshing or oscillation of water (or wave) caused by temporary displacement of geologic or constructed material in the event of a seismic-related failure. In the event of such a failure, the energy generated by a resulting wave or disturbance is expected to be very small given the size of the basin area. Additionally, the design of the ATF will be based on conservative parameter values, such that the potential for a geotechnical failure and resulting seiche would be minimized. Therefore, this impact is considered **less than significant**. No mitigation is required.

Alternative 3: Confined In-Bay ATF

Impacts under Alternative 3 would be similar to those described for Alternative 2. Piles associated with the booster pump platform and concrete anchors used to secure the transfer pipeline to the bay floor would both be designed in accordance with appropriate seismic design standards, as described for Alternative 1, to minimize the potential for liquefaction damage in the event of an earthquake.

The potential for seiche induced by geotechnical failure of the proposed ATF is considered to be minor. For the purposes of evaluating the potential impact under these alternatives, a seiche is a localized sloshing or oscillation of water (or wave) caused by temporary displacement of geologic or constructed material in the event of a seismic-related failure. In the event of such a failure, the energy generated by a resulting wave or disturbance is expected to be very small given the size of the basin area. Additionally, the design of the ATF will be based on conservative parameter values, such that the potential for a geotechnical failure and resulting seiche would be minimized. Therefore, this impact is considered **less than significant**. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Under Alternative 4, no new structures would be placed within San Pablo Bay, but potential for liquefaction of bay mud due to a seismic event could occur, thereby causing the direct channel walls to slump. Although this could result in a greater area of impact (estimated subtidal acreage impact ranges from 119 acres at 1V:3H slope, to 233 acres at 1V:15H slope), it would not substantially increase the risk of personal injury, loss of life, or damage to property.

The perimeter levee constructed at the BMKV basin could also be affected by earthquake induced liquefaction. Detailed geotechnical investigations and analyses would be conducted to address levee construction on bay mud at the BMKV site (as noted in the environmental analysis in the BMKV SEIS/EIR). As such, the perimeter levees would be designed in accordance with appropriate seismic design standards. Additionally, the BMKV project includes construction of flood control levees to protect adjacent communities from tidal flooding (in the event that the basin perimeter levee fails). This impact is considered ***less than significant***. No mitigation is required.

Impact GSS-4: Substantial Adverse Effects Resulting from Unstable Geologic Units (Compressible Bay Mud Deposits)

Alternative 1: No Action

The project area is underlain by an unknown thickness of young bay mud deposits, which typically consist of compressible silty clays that are susceptible to settlement when subjected to large, sustained loads. The off-loader platform and booster pump platform authorized under Alternative 1 would be either pile-secured or floating. Depending on the selected design, 3 to 24 piles would be driven into the bay mud deposits on the bottom of San Pablo Bay to secure the platform. Both designs would incorporate appropriate engineering standards necessary to prevent or minimize settlement and resulting structural damage. Additionally, the concrete anchors used to secure the transfer pipeline to the bay floor would also be designed in accordance with appropriate engineering standards. This impact is considered ***less than significant***. No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Under Alternative 2, the hydraulic cutterhead dredge head and other equipment used to transfer dredged materials are free-floating and thus, would not impose any load on the underlying bay mud deposits of San Pablo Bay. Similar to Alternative 1, piles associated with the booster pump platform and concrete anchors used to secure the transfer pipeline to the bay floor would both be designed in accordance with appropriate engineering standards, which would avoid or minimize damage resulting from settlement. This impact is considered ***less than significant***. No mitigation is required.

Alternative 3: Confined In-Bay ATF

Impacts under Alternative 3 would be similar to those described for Alternative 2. The design of the perimeter wall and sheet pile structure would incorporate appropriate engineering standards necessary to prevent or minimize settlement and associated damage. Piles associated with the booster pump platform and concrete anchors used to secure the transfer pipeline to the bay floor would also be designed in accordance with appropriate engineering standards, as described for Alternative 1.

The potential for seiche induced by geotechnical failure of the proposed ATF is considered to be minor. For the purposes of evaluating the potential impact under these alternatives, a seiche is a localized sloshing or oscillation of water (or wave) caused by temporary displacement of geologic or constructed material in the event of a seismic-related failure. In the event of such a failure, the energy generated by a resulting wave or disturbance is expected to be very small given the size of the basin area. Additionally, the design of the ATF will be based on conservative parameter values, such that the potential for a geotechnical failure and resulting seiche would be minimized. Therefore, this impact is considered **less than significant**. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Under Alternative 4, no new structures would be placed within San Pablo Bay. Although excavation of the direct channel would not impose any load on the underlying bay mud deposits, construction of the BMKV basin perimeter levee may result in settlement of compressible bay muds.

As reported in the BMKV SEIS/EIR, detailed geotechnical investigations and analyses would be conducted to address levee construction on bay mud at the BMKV site. The potential for seiche induced by geotechnical failure of the proposed ATF is considered to be minor. For the purposes of evaluating the potential impact under these alternatives, a seiche is a localized sloshing or oscillation of water (or wave) caused by temporary displacement of geologic or constructed material in the event of a seismic-related failure. In the event of such a failure, the energy generated by a resulting wave or disturbance is expected to be very small given the size of the basin area. Additionally, the design of the ATF will be based on conservative parameter values, such that the potential for a geotechnical failure and resulting seiche would be minimized. Therefore, this impact is considered **less than significant**. No mitigation is required.

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Section 4.3

Potential Impacts to Circulation and Sedimentation

4.3.1 Introduction

San Pablo Bay's existing circulation and sedimentation conditions are presented in Section 3.3, *Circulation and Sedimentation*. Potential impacts to circulation and sedimentation resulting from construction, maintenance, operation, and decommissioning of the proposed action or alternatives were evaluated against existing circulation and sedimentation conditions in the project area and the larger San Pablo Bay. Impacts analyses are based on the technical studies conducted for this project (See Appendix A of this SIES/EIR), studies and modeling conducted for the Oakland Harbor Navigation Improvement (-50-Foot) Project EIS/EIR (USACE and Port of Oakland, 1998), published literature, and best professional judgment.

4.3.2 Project Technical Studies

Table 4.3-1 summarizes the technical studies completed to support the impact analysis. A discussion of the DREDGE model used for the Oakland Harbor Navigation Improvement (-50-Foot) Project follows the table. These technical studies are incorporated by reference in this SEIS/EIR.

Table 4.3-1 Technical Studies Completed for this Project

Author	Title	Summary
Bruce Jaffe and Theresa Fregoso (U.S. Geological Survey [USGS] Coastal and Marine Geology 2006)	A History of Deposition, Erosion, and Mercury-Contaminated Hydraulic Mining Debris in the Region of the Proposed San Pablo Bay Aquatic Transfer Facility	This study presents the long-term sedimentation history of San Pablo Bay, including estimates of erosion and deposition in the region. New multi-beam bathymetric data were collected, analyzed, and incorporated as part of this study. This section also includes an analysis of the distribution and levels of mercury (Hg) in the bottom sediments of San Pablo Bay. Most of this sediment-laden Hg was derived from hydraulic gold mining operations in upland areas of central California and transported into San Francisco Bay by streams and rivers (post 1849).

Author	Title	Summary
David Schoellhamer, Neil Ganju, and Gregory Shellenbarger, (USGS Water Resources Division 2006)	Sediment Transport in San Pablo Bay	This study discusses suspended sediment distribution and transport in San Pablo Bay. In addition to a discussion of processes causing resuspension and transport, this report presents new data on waves, currents, and suspended sediment concentrations that were collected in proximity to the proposed ATF site.
Michael MacWilliams and Ralph Cheng (USGS Water Resources Division 2006)	Hydrodynamic Modeling of the Aquatic Transfer Facility, San Pablo Bay, California	This study presents detailed 3D hydrodynamic modeling of tidal currents in the region using the model UnTRIM to determine the local and far-field effects of the proposed ATF on tidal flows. This report also includes estimates of bottom shear stresses within and outside of the proposed ATF, as well as an analysis of plume dispersion of idealized suspended sediment.
Craig Jones (Sea Engineering Inc. 2007)	Aquatic Transfer Facility Sediment Transport Analysis	This study presents a calculation of erosion and deposition of sediment within the proposed ATF. Bottom sediment cores were collected in the potential ATF area and at a site in Richmond Harbor where dredged materials would likely be obtained. Laboratory analysis of these cores determined critical threshold bottom stresses and erosion rates for each of the sediment layers in the cores. The laboratory measurements were used in models to estimate erosion and deposition of the native and dredged materials.
USACE Engineer Research and Development Center (2007)	Preliminary Short-Term Fate (STFATE) Evaluation	This paper presents a calculation of dispersal and loss of dredged materials that would be deposited into the proposed ATF using USACE's STFATE model.
USACE Automated Dredging and Disposal Alternatives Management System (1998)	Oakland Harbor Navigation Improvement (-50-Foot) Project EIS/EIR, Appendix O, Modeling of Water Quality Impacts	The computer model DREDGE, part of USACE's Automated Dredging and Disposal Alternatives Management System, was used to predict suspended sediment concentrations downstream of dredging activities. The DREDGE model consists of a near-field model, which predicts the source strength (sediment resuspension in kilograms per second [kg/s], and a far-field model, which predicts transport of suspended sediment from the dredged area.

These technical studies are considered generally applicable to expected conditions in the project area. For the purposes of the analysis in this SEIS/EIR, the worst case scenarios from the studies were used, as the basis for evaluation of potential impacts to circulation and sedimentation.

The computer model DREDGE, which is part of USACE's Automated Dredging and Disposal Alternatives Management System, was used to predict suspended sediment concentrations downstream of dredging activities. The DREDGE model consists of a near-field model, which predicts the source strength (sediment resuspension in kg/s), and a far-field model, which predicts transport of suspended sediment from the dredged area. Impacts were evaluated for two types of dredges: a cutterhead dredge and a clamshell bucket dredge. Model runs simulated dredging of sediment from various locations and sediment types.

The near-field predictions of the DREDGE model depend on the characteristics of the dredge (type, size, and operation) and the sediments (density, size characteristics, settling velocity). A key model parameter is the source strength of the dredged material (sediment mass per unit time) leaving the area of dredging operations. The most likely scenario for a cutterhead dredge was use of an 18-inch diameter discharge pipe, while the most likely scenario for a clamshell bucket was a 15-cubic-yard (cy) bucket. The source strength assumes that approximately 50% of the sediments are contributed from barge overflow. The assumptions regarding types of dredges used in this modeling are consistent with the expected conditions under which construction and maintenance dredging associated with the proposed project and alternatives would take place.

The far-field component of the DREDGE model used site characteristics including water depth, velocity, and particle characteristics to determine suspended sediment transport. Sediment types (young bay mud, old bay mud, and Merritt sand) are similar to those that would be encountered in native sediments at the ATF site or in dredged material stored in the ATF basin. Modeling assumed a range of particle sizes and size distributions. Water depths ranged from 8.5 to 13.8 meters (m), which are consistent with depths in the majority of the proposed ATF area. Ambient water velocity was assumed to be 0.025 meter per second (mps). 1,500 milligrams per liter (mg/L) was used as a threshold value for impacts, based on a literature review of impacts to aquatic organisms.

4.3.3 Impact Mechanisms

The following construction, maintenance, operation, and decommissioning activities of each alternative may have the potential to adversely impact existing circulation and sedimentation:

- Maintenance and/or replacement of an approximate 28,000 foot dredged material transfer pipeline and pile driving for booster pump, should maintenance and/or replacement be required (Alternatives 1, 2, and 3);
- Maintenance and/or replacement of supporting piles for the off-loader facility platform, should it be required (Alternative 1);
- Excavation of a 1,000 by 1,500 foot ATF basin in San Pablo Bay and access channel (should the basin be in waters too shallow for safe navigation) (Alternatives 2 and 3);
- Driving piles for the confining wall support and installation of the confining walls (Alternative 3);
- Excavation of an approximate 23,000 foot long direct channel (Alternative 4);
- Excavation of a 1,000 by 1,500 foot BMKV basin, construction of a perimeter levee and subsequent breaching of the outboard levee hydraulically connecting the BMKV basin to San Pablo Bay (Alternative 4);
- Maintenance dredging of in-Bay facilities (including proposed ATF, access channel, and direct channel, depending on selected alternative) (Alternatives 2, 3, and 4); and
- Operational and decommissioning placement of dredged material in the proposed ATF basin (Alternatives 2, 3, and 4) including removal of sheet pile walls (Alternative 3);

As part of implementation of the goals of the Long-Term Management Strategy (LTMS), construction and operation of all alternatives would result in a reduction of in-Bay disposal in San Francisco Bay. The HWRP provides a mechanism for beneficial use of dredged sediments from dredging projects throughout San Francisco Bay, including San Pablo Bay. Construction and maintenance dredging for all alternatives would also result in removal of sediment from San Pablo Bay for beneficial use at the HWRP site for the duration of the restoration project (9–18 years, depending on the alternative chosen) and could also alter current speeds in the areas surrounding excavation. Alternatives 2, 3, and 4 could result in erosion of in-situ sediments surrounding excavation areas (i.e., ATF/BMKV basins and access channel/direct channel). Additionally, construction and maintenance dredging would resuspend bottom sediments in the area of dredging activity. Resuspended sediments would be carried with currents and settle in other areas of San Pablo Bay, resulting in sedimentation.

Operation of each alternative would result in redirecting dredged material from other dispersive in-Bay disposal sites (SF-9, SF-10, SF-11, and SF-16) to the respective dredged material transfer facility (off-loader, proposed ATF, or BMKV basin). Redirected material would be off-loaded from scows (Alternative 1), placed in an ATF basin in San Pablo Bay (Alternatives 2 and 3), or placed in the BMKV basin (Alternative 4). Redirecting material would reduce sediment input to the areas where material would be disposed and allow for operation and maintenance dredged material to be beneficially used for wetland restoration.

4.3.4 Thresholds of Significance

For the purposes of this analysis, an impact was considered to be significant and to require mitigation if it would cause:

- Alteration of existing circulation patterns of the site or San Pablo Bay in a manner that would lead to erosion or siltation of San Pablo Bay or the greater San Francisco Bay that would significantly alter the bathymetry of these Bays; and
- Alteration of existing circulation patterns that would lead to navigation hazards or flooding of property caused by increases in tidal elevations.

4.3.5 Impacts and Mitigation Measures

The following table summarizes the impacts and the significance determinations for each of the alternatives, relative to Circulation and Sedimentation.

Table 4.3-2. Summary of Circulation and Sedimentation Impacts

Impact	Alternative 1: Dredged Material Off-loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BKMV Basin
Impact CS-1: Alteration of San Pablo Bay Circulation	Less than significant	Less than significant	Potentially significant	Less than significant
Impact CS-2: Resuspension, Sedimentation, and Erosion of In-Situ Sediments during and following Construction and Maintenance	Less than significant	Less than significant	Less than significant	Less than significant
Impact CS-3: Settling of Suspended Sediments during Operational and Decommissioning Placement of Dredged Material	Less than significant	Less than significant	Less than significant	Less than significant
Impact CS-4: Alteration of San Pablo Bay and San Francisco Bay Sediment Inputs from Redirection of Dredged Material	Less than significant	Less than significant	Less than significant	Less than significant
Impact CS-5: Compliance with the Goals of the San Francisco Bay LTMS	Beneficial	Beneficial	Beneficial	Beneficial

Impact CS-1: Alteration of San Pablo Bay Circulation

Alternative 1: No-Action

The structures associated with Alternative 1 are currently in place and operational in San Pablo Bay. Maintenance and/or replacement of these structures may require disturbance of either portions or the entire approximate 0.19-acre (ac) footprint of San Pablo Bay bottom substrate. Maintenance could involve replacement of piles for the booster pump and/or off-loader facility platforms; the associated pile driving would result in disturbance of in-situ sediments.

In-Bay structures associated with Alternative 1 are minimal, consisting of a pipeline, and piles for a booster pump and an off-loader facility platform (which would encompass approximately 28 acres). Operation of Alternative 1 is not expected to alter the bathymetry or circulation of San Pablo Bay. Because Alternative 1 results in minor changes to San Pablo Bay, any resulting changes in currents would be minimal and localized around the pilings. As such, any construction or maintenance activities that may be required are expected to result in less than significant impacts to San Pablo and San Francisco Bay current velocity, bathymetry, and tidal prism. This impact is considered to be ***less than significant***. No mitigation is required.

Alternative 2: Unconfined ATF (Proposed Action)

MacWilliams and Cheng (2007) conducted modeling of San Pablo Bay using UnTrim to simulate the hydrodynamic impacts (i.e., changes to water levels, current velocity, and bed shear stress) to San Pablo Bay from construction and operation of both Alternatives 2 and 3. Details of the predicted changes in current velocities in the immediate project vicinity of the ATF basin resulting from construction and operation of Alternatives 2 and 3 are presented in Chapter 3 of Appendix A.

Following construction of Alternative 2, changes in current velocities would range between 0.1 – 0.4 knot (2–8 inches/sec or 5–20 centimeters per second [cm/sec]) within a few kilometers (km) of the proposed ATF basin and less than 0.02 knot (0.4 inch/sec or 1 cm/sec) for the greater San Pablo Bay. The magnitude of velocity changes is expected to be similar for both flood and ebb tides; however, the direction of the flow would reverse (MacWilliams and Cheng 2007).

Following construction of the proposed ATF basin, the bathymetry of a small portion of San Pablo Bay would be altered and water levels within the basin are expected to be reduced by up to 0.8 inch (2 centimeters [cm]), depending on how full the basin is. Water level changes outside the basin are not expected to be perceptible.

Existing current velocities in the project area generally range between 1 – 3 knots, with 3 knots being very high. As such, the modeling studies indicate that the simulated changes in current velocities, ranging from 0.02–0.4 knot and water levels would be small and insignificant compared to existing conditions. Upon project completion, the ATF basin would be returned to the surrounding elevations and the dredged material transfer pipeline and booster pump would be removed; resulting in a return to current velocities. This impact is considered to be ***less than significant***. No mitigation is required.

Alternative 3: Confined ATF

Construction and operation of Alternative 3 would deepen a small portion of San Pablo Bay, slightly reduce the water levels within the proposed ATF basin, and increase the existing current velocities (1–3 knots) by 0.4–0.6 knot (8–12 in/sec or 20 to 30 cm/sec) along the edge of the ATF basin, with strong currents being diverted around the confining walls. Because currents are diverted around the confining walls, it is expected that a well-defined wake zone would form downstream of the proposed ATF under this alternative (MacWilliams and Cheng, 2007). The vorticity (rotational spin of fluid) of the wake zone was not simulated for this alternative; therefore, impacts to San Pablo Bay resulting from formation of eddies could be ***potentially significant***. However, the potential impact area could be limited due to the relatively small velocity existing under normal conditions. Therefore, no mitigation is currently proposed to reduce the vorticity in the wake zone. As with Alternative 2, following project completion, the project area would be returned to the surrounding elevations, and project related structures would be removed from San Pablo Bay, therefore avoiding this potential to impact on San Pablo Bay circulation.

Alternative 4: Direct Channel to BMKV

Construction of Alternative 4 would require excavation of a 23,000- by 180-foot direct channel in San Pablo Bay to a depth of -17 feet mean lower low water (MLLW) from the near SF-10 to the proposed BMKV basin. Additionally, Alternative 4 would require excavation of a 1,000- by 1,500-foot BMKV basin in an upland environment, and include subsequent breaching of the outboard levee connecting the basin to San Pablo Bay. Other than navigation aids, no structures would be installed in San Pablo Bay under Alternative 4.

It is anticipated that the velocity of currents within the direct channel would be slightly increased and that the increased flows would remain trapped within the channel walls. Although the direct channel would encompass approximately 123 to 243 ac of San Pablo Bay bottom, the depth of the channel would be relatively shallow, compared to the depth of the ATF basin designs proposed for Alternatives 2 and 3. Following restoration of the HWRP site, the footprint of the direct channel and the BMKV basin would be restored to surrounding elevations, thus returning current velocities to surrounding conditions. As such, potential impacts to San Pablo Bay current velocities resulting from construction and operation of Alternative 4 are considered ***less than significant***. No mitigation is required.

Impact CS-2: Resuspension, Sedimentation, and Erosion of In-Situ Sediments during and following Construction and Maintenance

Resuspension of sediments in estuaries resulting from dredging and dredged material placement is often considered an impact on water and sediment quality; however, because construction and maintenance activities (excavation, maintenance dredging of access channels, pile driving, etc.) can resuspend sediments that are subsequently carried by currents until they settle in other parts of the Bay (sedimentation), the potential for sedimentation resulting from construction, maintenance, and, decommissioning are discussed here. The mechanisms for resuspension of sediments during construction, maintenance, and decommissioning of each alternative are discussed in Section 4.4-4, *Impacts to Water Quality*, and are not further presented here. Following construction and maintenance of the alternatives, in-situ sediments could erode into deepened areas.

Alternative 1: No-Action

Resuspension of in-situ sediments could occur during maintenance and/or replacement of the dredged material transfer pipeline, booster pump, or off-loader facility platform as they are agitated. The footprint of these facilities is small, and includes 0.19 ac of Bay bottom footprint for the pipeline, and the footprint of the placement of approximately 28 piles (4 piles for the booster pump platform and 24 for the off-loader facility platform), some of which may need to be replaced during the life of the project. The potential for sedimentation of resuspended sediments or erosion of in-situ sediments is expected to be minimal, since maintenance and/or replacement of structures under Alternative 1 would be limited and affect only a small area of San Pablo Bay. This impact is considered ***less than significant***. No mitigation is required.

Alternatives 2 and 3

Construction, maintenance, and decommissioning activities that could result in resuspension, sedimentation, or erosion of in-situ sediments include excavation of the proposed ATF basin and access channel (should the channel be required) and repair/replacement of the dredged material transfer pipeline. Construction excavation would be conducted using a cutterhead dredge and sediments would be directly transferred from the cutterhead to the transfer pipeline for beneficial use at the HWRP site; thus limiting the amount of in-situ sediments that could be reintroduced to the water column and settle elsewhere in San Pablo Bay. There may be instances where excavation requires the use of a mechanical clamshell dredge; in these instances, material would be placed in a scow for proper transport to an approved disposal site.

Under alternative 3, sheet pile walls would require pile driving and would result in resuspension sedimentation and erosion of in-situ sediments.

Following excavation of the ATF basin and access channel, sediments surrounding the basin and channel could erode into the newly deepened facilities. Sea Engineering, Inc. (2007) conducted modeling to simulate the effect of ATF excavation on sediment shear stress and the potential for sedimentation and erosion of sediments following construction (results of this study are provided in Appendix A, Chapter 4). Results of the simulation provide a conservative estimate of a 10% increase in bottom sediment total shear stress following excavation of the proposed ATF (see Figures 4.3-1 and 4.3-2 showing changes in shear stress). Total sheer stress is a combination of skin friction[1] and drag friction; however, only skin friction changes can lead to erosion. The critical shear stress that could lead to erosion of native sediments could be exceeded; however, it is only expected to occur during peak tidal flows, resulting in only a small amount of sediment erosion (Sea Engineering, Inc. 2007). The anticipated erosion is not expected to exceed 0.4 inch, extending for approximately 3,300 feet north and south of the basin.

Maintenance of facilities under Alternatives 2 and 3 would require annual dredging of the access channel and periodic dredging of the ATF basin. Material dredged from the access channel would be placed in the ATF for subsequent use at the HWRP site. Maintenance and/or replacement of the dredged material transfer pipeline would be similar to that discussed for Alternative 1.

During construction excavation of the proposed ATF basin and access channel, a large portion of the in-situ sediments would be directed into the cutterhead by hydraulic action of the pipeline and not be reintroduced to the water column. Additionally, during construction excavation of the ATF basin, it is expected that much of the bottom sediments that are resuspended will be trapped within the boundaries of the basin or channel. As such, this impact is considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Excavation of the direct channel and breaching the outboard levee to provide navigation access to the upland BMKV basin would resuspend in-situ sediments that could settle in other parts of San Pablo Bay. Excavation of the direct channel would occur in subtidal and mudflat habitats, areas of San Pablo Bay known to contain fine-grained sediments. Once resuspended, fine-grained sediments stay suspended in water longer and can travel further than coarse-grained sediments. Further, excavation in shallow waters, such as the shallow intertidal and mudflat areas where the direct channel would be constructed, could resuspended more sediments for longer periods due to wind-wave action.

Following excavation of the direct channel, it is expected that the 4-foot horizontal, 1-foot vertical side slopes would erode, resulting in 15H: 1V foot side slopes. The area of the erosion after excavation is expected to be result in approximately 120 ac of San Pablo Bay bottom.

Maintenance of the direct channel would require annual dredging of approximately 424,000 cy of shoaled material. Maintenance dredging of the direct channel would also result in resuspension of sediments, a majority of which are expected to remain in the channel. Similar to constructing the direct channel, sediments resuspended during maintenance of the channel are not expected to be transported outside San Pablo Bay.

Construction of Alternative 4 would result in limited sedimentation of resuspended in-situ sediments during excavation of the direct channel and breaching of the outboard levee; following excavation of the direct channel, in-situ sediments would erode into the channel. Maintenance dredging would also

[1] Skin friction is the stress exerted on sediments by fluid velocity

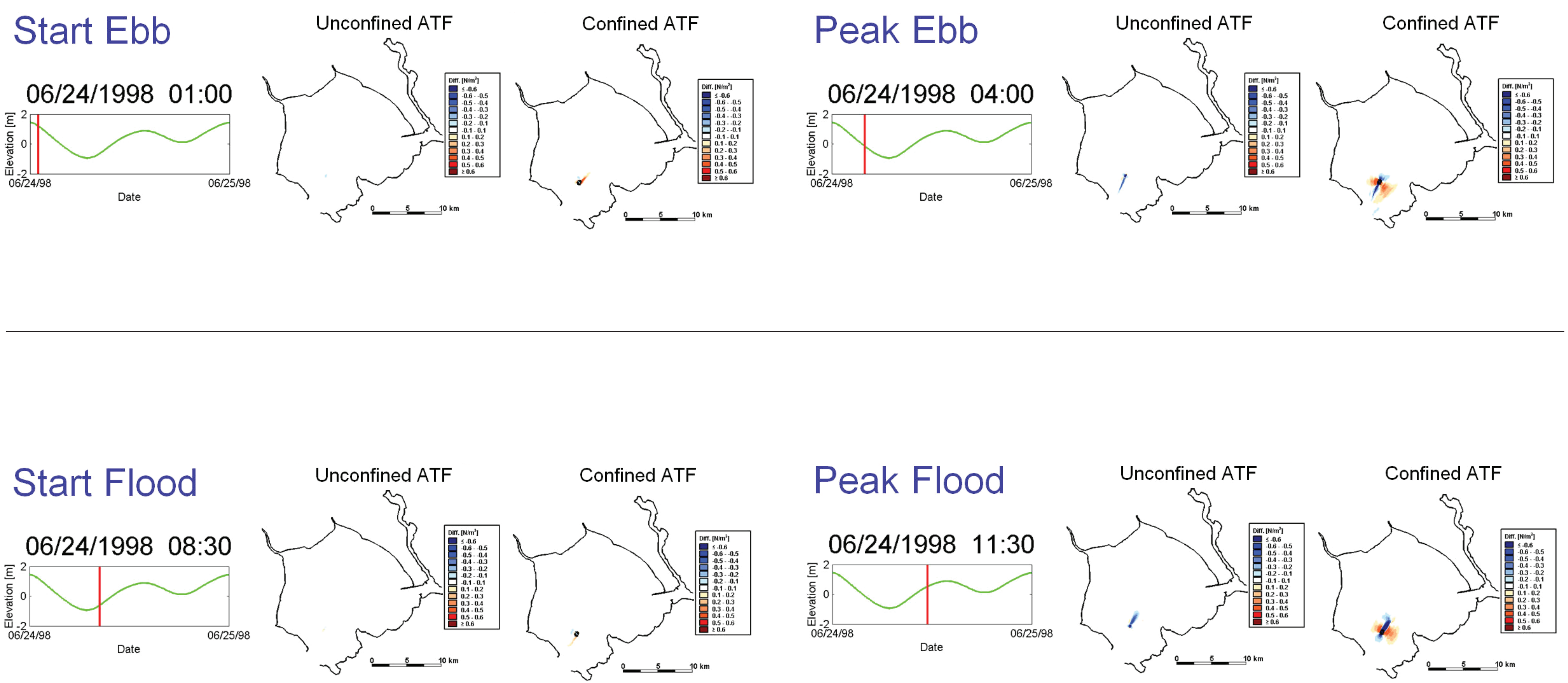

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Figure 4.3-1
Shear Stress Difference between Alternatives 2 and 3, San Pablo Bay

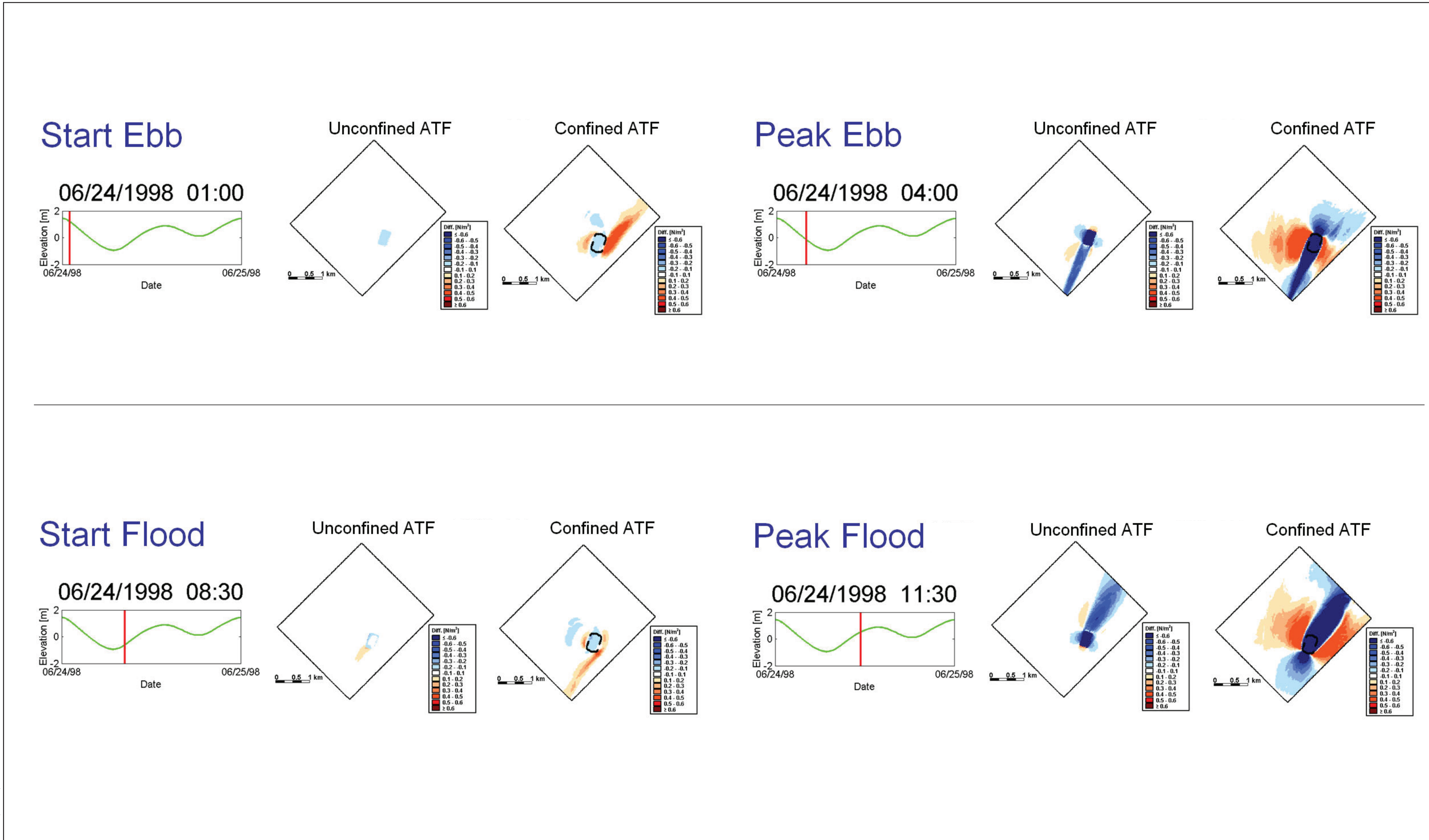

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Figure 4.3-2
Shear Stress Difference between Alternatives 2 and 3, Proposed ATF Region

result in resuspension of materials that could settle in other parts of San Pablo Bay. Once the HWRP is completed, the direct channel and BMKV basin would be decommissioned and restored to the surrounding elevations, removing sedimentation impacts on San Pablo Bay. As such, this impact is considered ***less than significant***. No mitigation is required.

Impact CS-3: Settling of Suspended Sediments during Operation and Decommissioning Placement of Dredged Material

Operation and decommissioning placement of dredged material for all alternatives would involve redirecting dredged material placement from other in-Bay disposal sites to the off-loader facility or proposed ATF basin. Placement of dredged material during operation and for decommissioning in any of the ATF basins would generate suspended sediment plumes that could be transported by currents to other parts of San Pablo Bay. The mechanisms for suspended sediment transport during operational and decommissioning placement of dredged material are discussed in Section 4.4.4, *Impacts to Water Quality*, and are not further presented here.

Alternative 1: No-Action

The off-loader facility would not place dredged material in San Pablo Bay waters; rather it would pump dredged material directly from scows to the HWRP site. There is a small chance that material could be spilled during operation of the off-loader facility, thus introducing suspended sediment into San Pablo Bay. Impacts associated with accidental spills are expected to be minimal, and would be further reduced by implementation of a spill prevention plan. As such, this impact is expected to be ***less than significant***. No mitigation is required.

Alternative 2: Unconfined ATF (Proposed Action)

Alternative 2 would result in an average of 1.6 mcy (and up to 3.6 mcy in a maximum year) of dredged material being redirected from other in-Bay disposal sites to the proposed ATF basin each year. During dredged material placement, sediments would be stripped from the descending plume and be carried by currents until they settle in other parts of San Pablo Bay. Redirecting dredged material from the SF-10 disposal site, located in San Pablo Bay, and the SF-16 disposal site, located in Suisun Bay, would offset some of these impacts, since disposal of dredged material at these sites and subsequent resuspension of sediments is considered the baseline condition (SF-10 is authorized to accept up to 500,000 cy of dredged material per month and is fully dispersive). Redirecting dredged material from disposal sites located in other parts of the Bay (SF-9 in Suisun Bay, which is also fully dispersive, and SF-11 in Central San Francisco Bay), on the other hand, would introduce more suspended sediment to San Pablo Bay that could subsequently settle in other areas.

According to the STFATE simulations conducted for this project (ERDC 2007), an average of 4% of the dredged material (with a range of 2 to 16%) placed in the ATF could be stripped from the plume and introduced to the water column under an average current velocity of 1.9 knots (1m/sec) and pit depths ranging from 25 to 60 feet MLLW. If the average of 1.6 mcy of dredged material is placed in the ATF basin annually for beneficial use at the HWRP site with an average 4% of material stripped, then approximately 64,000 cy would be redistributed in San Pablo Bay (this would increase to 144,000 cy in a maximum case). Using the full studied range (2 to 16%), between 32,000 cy and 256,000 cy (72,000 cy to 576,000 cy in a maximum year) of sediment could be stripped from the placed material and redistributed annually over a large area in San Pablo Bay (on the order of 10 miles [mi] by 1 mi). Sixteen percent is a very conservative estimate and assumes that currents in San Pablo Bay can reach 3 knots). Reasonably, this amount of sediment stripped during operation of this alternative could result in less than 2 cm/yr of sedimentation in San Pablo Bay. It is anticipated that redirecting dredged material from other in-Bay disposal sites to the ATF would not result in redistribution of sediments that would significantly alter the bathymetry of San Pablo Bay bottom above existing conditions. As such, this impact is expected to be ***less than significant***. No mitigation is required.

Alternative 3: Confined ATF

Under Alternative 3, Mechanisms that cause suspended sediments to settle in other parts of San Pablo Bay during dredged material placement would be similar to those discussed for the unconfined ATF under Alternative 2. However, the confining walls of the proposed ATF under Alternative 3 would trap suspended sediment within the basin, thus limiting sedimentation of suspended sediments in other parts of San Pablo Bay. As such, this impact is considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Under alternative 4, dredged material would be placed in the BMKV basin. The basin would be constructed such that there would be an approximately 180-foot opening allowing water to circulate into and out of the basin. During placement of dredged material, some sediment stripped from the descending plume could escape through the opening and settle in other parts of San Pablo Bay; however, it is expected that the redistributed amount would be small. As such, this impact is considered ***less than significant***. No mitigation is required.

Impact CS-4: Alteration of San Pablo Bay and San Francisco Bay Sediment Inputs from Redirection of Dredged Material

All alternatives would result in dredged material being redirected from other dispersive in-Bay disposal sites (including SF-9, SF-10, SF-11, and SF-16) and the deep ocean disposal site (DODS) to the HWRP site. The reduction of in-Bay sediment disposal volumes and beneficial use of dredged material is one of the primary goals of the LTMS.

In order to assess the potential effect of redirecting material, a control volume and mass balance scheme was developed to derive a first order estimate of changes of sediment supply to different parts of the greater San Francisco Bay (Suisun Bay, San Pablo Bay, San Francisco Bay). Depending on tidal currents and other factors (wind, wave, etc.) , sediment deposited at different disposal sites disperses as follows: at SF-16 sediment redistributes in Suisun Bay or exits through the Carquinez Straight; sediment at SF-9 disperses into Suisun Bay and San Pablo Bay; sediment at SF-10 is redistributed in San Pablo Bay or exits San Pablo Bay into San Francisco Bay; and the sediment at SF-11 site either exits through the Golden Gate or redistributes within San Francisco and San Pablo Bays. Sediment deposited outside the Golden Gate at SF-8 or DODS is assumed for this analysis to remain outside of the Golden Gate. The baseline information of sediment inputs of San Francisco and San Pablo Bay are presented in Figure 3.3-5. For the purpose of this analysis, the following assumptions were made as to the fate of material placed at existing dispersal sites based on existing circulation patterns: SF-16 – all material is redistributed in Suisun Bay; SF-9 – 50% of material disperses to Suisun Bay and 50% to San Pablo Bay; SF-10 – 50% of material disperses to San Pablo Bay and 50% to Central San Francisco Bay; and SF-11 - 10% of material disperses to San Pablo Bay, 40% to Central San Francisco Bay, and 50% exits to the ocean through the Golden Gate.

Table 4.3-3 shows assumed average conditions from 2000 to 2007 relative to sediment inputs to different parts of the bay. Sediment inputs are defined as inflow (as shown on Figure 3.3-5) and placement of dredged material.

Table 4.3-3. Existing Sediment Inputs **(2000-2007)**

Site	%	cy/year[(1)]	%	Suisun Bay	%	San Pablo Bay	%	San Francisco Bay	%	Ocean
SF-8	14.8%	375,259							100%	375,259
SF-9	3.5%	89,015	50%	44,508	50%	44,508				
SF-10	8.9%	225,678			50%	112,839	50%	112,839		
SF-11	48.0%	1,215,447			10%	121,545	40%	486,179	50%	607,724
SF-16	9.8%	247,010	50%	51,899	50%	51,899				
DODS	14.9%	378,008							100%	378,008
Total	**100.0%**	**2,530,416**		**96,407**		**330,790**		**599,018**		**1,360,990**
Sediment Inputs [(2)]				*4,596,407*		*6,250,790*		*6,860,000*		

Notes:
[1] 2000–2007 Conditions based on Table 2-2 amounts. Assumptions about distribution based on general circulation patterns.
[2] Sediment inputs include inflow from upstream areas as shown in Figure 3.3-5 and dredged material placement at sites within embayment.

Redirecting dredged material from the in-Bay sites to the off-loader or the non-dispersive ATF and BMKV basins would reduce the amount of sedimentation in other embayments (predominately San Francisco Bay and San Pablo Bay). Once dredged material has been placed at the HWRP site, the levees separating the site from San Pablo Bay would be breached and some of the sediment would be re-introduced to San Francisco Bay's sediment inputs.

In order for redirection of sediments to result in substantial changes in erosive conditions, the change in sediment inputs would need to be sustained over a lengthy period of time and consequential in the amount of change in overall sediment inputs. For this analysis, changes of less than 10% are determined to be less than significant.

Alternative 1: No-Action

The dredged material off-loader facility has the average capacity to transfer approximately 1.2 mcy of dredged material from San Francisco Bay annually (this is already authorized and considered the baseline condition). The potential impact to San Pablo Bay and the greater San Francisco Bay depends on the disposal site the dredged material is redirected from and the amount of material redirected, which could change slightly every year. San Pablo Bay is an erosive environment (Schollhammer 2007) and thus redirection of material could increase erosion.

It is expected that redirecting material to the HWRP with Alternative 1would result in loss of approximately 2% of the sediment that enters Suisin Bay, 3% of the amount of sediment that enters San Pablo Bay, and 4% of sediment that enters San Francisco Bay (See Table 4.3-4).

Table 4.3-4. Changes in Sediment Inputs

Site	%	cy/year[1]	%	Suisun Bay	%	San Pablo Bay	%	San Francisco Bay	%	Ocean
Alternative 1 [3]										
SF-8	14.8%	177,959							100%	177,959
SF-9	3.5%	42,214	50%	21,107	50%	21,107				
SF-10	8.9%	107,023			50%	53,512	50%	53,512		
SF-11	48.0%	576,402			10%	57,640	40%	230,561	50%	288,201
SF-16	9.8%	117,139	50%	51,899	50%	51,899				
DODS	14.9%	179,263							100%	179,263
Total	**100.0%**	**1,200,000**		**73,006**		**184,158**		**284,072**		**645,423**
Stripped Material				0	0%	0	0%			
Redirected Amount				73,006		184,158		284,072		645,423
Sediment Inputs [2]				*4,596,407*		*6,250,790*		*6,860,000*		
Change in Sediment Inputs				1.6%		2.9%		4.1%		
Alternatives 2, 3, 4 [4]										
SF-8	14.8%	237,279							100%	237,279
SF-9	3.5%	56,285	50%	28,142	50%	28,142				
SF-10	8.9%	142,697			50%	71,349	50%	71,349		
SF-11	48.0%	768,536			10%	76,854	40%	307,414	50%	384,268
SF-16	9.8%	156,186	50%	51,899	50%	51,899				
DODS	14.9%	239,017							100%	239,017
Total	**100.0%**	**1,600,000**		**80,041**		**228,244**		**378,763**		**860,564**
Stripped Material					2%	32,000	2%	32,000		
Redirected Amount				80,041		196,244		346,763		
Sediment Inputs[2]				*4,596,407*		*6,250,790*		*6,860,000*		
Change in Sediment Inputs				1.7%		3.1%		5.1%		

Notes:
[1] 2000 - 2007 Conditions based on Table 2-2 amounts. Assumptions about distribution based on general circulation patterns.
[2] Sediment inputs include inflow from upstream areas as shown in Figure 3.3-5 and dredged material placement at sites within embayment.
[3] Alternative 1 annual average dredged material transfer of 1.2 mcy from Chapter 2. No assumed loss during transfer.
[4] Alternative 2, 3, 4 annual average dredged material transfer of 1.6 mcy from Chapter 2. Assumed 4% loss stripped during transfer, split evenly between San Pablo Bay and San Francisco Bay.

The sediment would be lost from the system for the duration of the project; however, following project completion, sediment not sequestered would be reintroduced to San Pablo Bay. Since changes in sediment inputs often takes several years before they are perceptible, 18 years is considered temporary for this analysis. Redirecting sediments from in-Bay disposal sites would not result in changes to sediment inputs in different embayments in the greater San Francisco Bay that are greater than 10% and this impact is considered temporary; as such, this impact is considered ***less than significant***. No mitigation is required.

Alternatives 2-4:

Operation of Alternatives 2, 3, and 4 would increase the amount of dredged material that would be redirected from other in-Bay disposal sites by up to 400,000 cy per year relative to Alternative 1. However, placement of material in an open water environment will also incur limited losses of material during deposition, which is estimated as averaging 4% as discussed above under Impact CS-3. It is expected that redirecting material for Alternatives 2, 3 and 4 would alter Suisun Bay's sediment inputs by 2%, San Pablo Bay's sediment inputs by up to 3% and San Francisco Bay's sediment inputs by up to 5% (See Table 4.3-4).

The conservative estimate of the potential changes to different embayments in the greater San Francisco Bay's sediment inputs is less than 10%. Moreover, changes to the sediment inputs would be temporary, persisting only during the 9 to 10 years any of these alternatives would be operating. As such, this impact is considered ***less than significant***. No mitigation is required.

Impact CS-5: Compliance with the Goals of the San Francisco Bay LTMS

All Alternatives

One of the primary goals of the San Francisco Bay LTMS is to reduce disposal of dredged material at the in-Bay sites in order to reduce impacts to water quality and aquatic resources resulting from aquatic disposal. To reduce in-Bay disposal and associated impacts, the San Francisco Bay LTMS calls for beneficially using 40% of the material dredged from Bay Area dredging projects. Implementation of any of the Alternatives would meet the goal of the LTMS by beneficially using 1.5 – 2.5 mcy (Alternative 1 and Alternatives 2, 3, and 4, respectively) of dredged material at the HWRP site. Although Alternatives 2 and 3 would still result in placement of dredged material in San Pablo Bay, the impacts to water quality and aquatic resources resulting from dredged material disposal would be reduced at other in-Bay disposal sites and concentrated in the vicinity of the ATF. The confining walls under Alternative 3, however, would further reduce the impacts associated with dredged material placement. Because all of the alternatives would result in compliance with the goals of the San Francisco Bay LTMS, as well as provide dredged material for the HWRP site, this impact is consider ***beneficial***.

Section 4.4

Potential Impacts to Water and Sediment Quality

4.4.1 Methodology for Impact Analysis

Potential impacts to water and sediment quality resulting from construction, operation, and decommissioning of the proposed action or alternatives were evaluated against existing water quality conditions, both at the project site(s) and within San Pablo Bay. Existing water and sediment quality, and suspended sediment concentrations in the project area are discussed in Section 3.4, *Water and Sediment Quality*. Potential impacts to existing water and sediment quality are qualitatively assessed based on technical studies conducted for the proposed action and alternatives, studies conducted for similar projects, existing data, and literature. The standards for impacts are based on the degree to which the various alternatives could result in violations of water quality standards and/or impairment of beneficial uses or impacts to water quality standards that could result in harm to aquatic life and/or human health.

This impact assessment is based on an evaluation of suspended sediments that could be released into the water column, subsequent transport of suspended sediments to other areas in San Pablo Bay, as well as the release of contaminants from disturbance of in-situ sediments during construction, maintenance, and decommissioning of the alternatives. Impacts resulting from operational placement of dredged material and subsequent transfer to the HWRP site are also discussed in this section.

4.4.2 Impact Mechanisms

The following construction activities could result in direct or indirect impacts to water and sediment quality:

- Pile driving and removal;
- Channel and basin excavation;
- Dredged material placement and subsequent removal; and
- Use of construction equipment in San Pablo Bay waters.

Construction of the proposed alternatives would disturb bottom sediments, which could impact water quality by potentially increasing suspended sediment concentrations, reducing dissolved oxygen levels, and releasing constituents of concern to the water column.

Operational aspects of the proposed alternatives that could affect water quality include:

- Placement of dredged material or off-loading activities;
- Transfer of dredged material from the unconfined ATF basin, confined ATF basin, and BMKV basin;
- Maintenance of ATF structures; and
- Use of hydraulic dredging powered equipment.

Operation of Alternative 2, 3, or 4 would result in dredged material plumes descending through the water column at the ATF and increased suspended sediment concentrations in waters around the ATF during dredged material placement. Sediment would also be disturbed during periodic maintenance of ATF structures (e.g., dredged material transfer pipeline), which could expose the water column to increased suspended sediments. Any potential constituents of concern associated with dredged material and sediments disturbed during maintenance dredging activities have the potential to be released into the waters and sediments of San Pablo Bay. The use of diesel-powered equipment could also expose San Pablo Bay waters to hazardous materials, which is discussed in Section 4.10, *Petroleum and Hazardous Materials*.

Once dredged material is no longer needed at the HWRP site, the components of the selected alternative would be decommissioned. Depending on the alternative chosen, decommission would involve the removal of the dredged material transfer pipeline and associated booster plumps (all alternatives); removal of the off-loader facility (Alternative 1); filling of the ATF basin, which would involve placement of dredged material into the basin and natural sedimentation (Alternatives 2, 3, and 4); removal of the confining walls (Alternative 3); filling of the access channel (should it be constructed) and direct channel (Alternatives 2, 3, and 4); and backfilling the BMKV basin.

4.4.3 Threshold of Significance

For the purposes of this analysis, an impact on water quality is considered significant and would require mitigation if it would violate water quality standards, including adopted total maximum daily loads (TMDLs), which would impair beneficial uses of water. TMDLs identify sources of pollutants and further define how much of a pollutant a water body can receive and still meet water quality standards. Beneficial uses of San Pablo Bay are defined by the Regional Water Quality Control Board (RWQCB) and include industrial process water supply or service supply, water contact and non-contact recreation, wildlife habitat, fish migration and spawning, navigation, estuarine habitat, shellfish harvesting, preservation of rare and endangered species, and ocean, commercial, and sport fishing.

4.4.4 Impacts and Mitigation Measures

The following table summarizes the impacts and the significance determinations for each of the alternatives, relative to Water and Sediment Quality.

Table 4.4-1. Summary of Water and Sediment Quality Impacts

Impact	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined ATF	Alternative 4: Direct Channel to BMKV Basin
Impact WSQ-1: Compliance with the Comprehensive Conservation and Management Plan (CCMP) and the San Francisco Bay LTMS	Beneficial	Beneficial	Beneficial	Beneficial
Impact WSQ-2: Potential to Increase Suspended Sediment Concentrations during Construction, Maintenance and Decommissioning	Less than significant	Less than significant with mitigation	Less than significant with mitigation	Less than significant with mitigation
Impact WSQ-3: Potential to Increase Suspended Sediment Concentrations during Operation	Less than significant	Less than significant with mitigation	Less than significant	Less than significant
Impact WSQ-4: Potential to Release Constituents of Concern during Construction, Maintenance, and Decommissioning	Less than significant	Less than significant with mitigation	Less than significant with mitigation	Less than significant with mitigation
Impact WSQ-5: Potential to Degrade Water Quality due to Increased Methylmercury Formation	Less than significant	Less than significant with mitigation	Less than significant with mitigation	Less than significant with mitigation
Impact WSQ-6: Potential to Release Constituents of Concern during Operation	Less than significant	Less than significant	Less than significant	Less than significant
Impact WSQ-7: Potential to Reduce Dissolved Oxygen Levels	Less than significant	Less than significant	Less than significant	Less than significant
Impact WSQ-8: Potential to Impact Nutrient Loads	Less than significant	Less than significant	Less than significant	Less than significant

Impact WSQ-1: Compliance with the Goals of the CCMP and San Francisco Bay LTMS

All Alternatives

As mandated by Congress in 1997 (CWA Section 320), the San Francisco Estuary Project prepared a CCMP for the San Francisco Estuary. Updated in 2007, the CCMP serves as a blueprint to guide planning efforts to restore and enhance estuaries. The CCMP outlines specific goals and objectives for San Francisco Bay, including reducing in-Bay disposal, beneficially using dredging material, protecting aquatic organisms, and restoring aquatic habitats.

The LTMS carries out the goals and objectives of the *Dredging and Waterway Modification* section of the CCMP. One of the main goals of the LTMS is to reduce the impacts on aquatic resources resulting from in-Bay disposal by beneficially using 40% of material dredged from San Francisco Bay dredging projects, disposing 40% at ocean disposal sites (SF-8 and SF-DODS), and disposing only 20% at in-Bay sites.

All alternatives would further the goals of the CCMP and San Francisco Bay LTMS by providing a mechanism to reducing in-Bay disposal, beneficially use dredged material, and restore approximately 2,200 ac of wetland habitat. These alternatives allow the following CCMP objectives to be realized:

- Objective DW-3: Develop a comprehensive regional dredging strategy. Specifically, the alternatives allow for Action DW-3.2, beneficially using dredged material.
- Objective DW-4: Encourage use of dredged material for restoration projects. The alternatives would allow for approximately 1.2 to 1.6 mcy of dredged material to be beneficially used for wetland restoration each year.
- Objective AR-7: Protect, enhance, and restore subtidal habitats. Reducing in-Bay disposal and restoring the HWRP site would improve water quality in San Francisco Bay by reducing concentrations of suspended sediment and associated constituents of concern.
- Objective WT-4: Expand wetland base. Restoration of the HWRP site would expand the existing San Francisco Bay Area wetland base by approximately 2,200 ac. Reestablishing wetlands around San Francisco Bay would also improve water quality.

Each alternative would meet the goals of the CCMP and LTMS by reducing in-Bay disposal, beneficially using dredged material, and creating approximately 2,200 ac of wetland habitat at the HWRP site. Overall, the alternatives would result in a ***beneficial*** impact on water quality in San Francisco Bay.

Impact WSQ-2: Potential to Increase Suspended Sediment Concentrations during Construction, Maintenance and Decommissioning

Total suspended solids are a measure of the amount of dry weight mass of non-dissolved solids suspended per unit of water (often measured in mg/L). Total suspended solids includes inorganic solids (clay, silt and sand) and organic solids (algae and detritus) (ERDC 2000).

Turbidity is an optical property of water that causes light to be scattered and absorbed by suspended particles as it passes through a water column. Particles that can affect turbidity include inorganic solids (clay, silt and sand), organic solids (algae and detritus) and living organisms (phytoplankton and zooplankton) (APHA 1992). Turbidity is expressed in Nepholometric Turbidity Units (NTU). For the purposes of this analysis, total suspended solids (mg/L) are used, rather than turbidity (NTU).

Increased suspended solids impact aquatic ecosystems in three ways: (1) physical impacts related to the physical properties of suspended sediments (e.g., reduced light transmission, or increased turbidity, and biological affects resulting from contact with particulate); (2) chemical impacts related to chemicals associated with suspended solids (including chemical impacts on biological receptors); and (3) resettling impacts that can smother aquatic habitats and organisms. Resuspended sediments can cause localized changes in ambient water chemistry, pH, and dissolved oxygen concentrations. Changes in light transmission can affect primary production by limiting photosynthesis and reduce foraging abilities for organisms that rely on visual signals for feeding (e.g., salmonids and several species of birds) (Anchor Environmental 2003).

This section discusses suspended solids and constituents of concern associated with these particles that could be released into the water column during construction, operation, and decommissioning the proposed action and alternatives. For a discussion regarding potential impacts on biological receptors (including aquatic species), indirect impacts resulting from reduction in light transmission, and resettling of suspended sediments, please see Section 4.3, *Circulation and Sedimentation*, and Section 4.5, *Marine and Terrestrial Biology*.

Alternative 1: No Action

Replacement and/or repair of the existing off-loader platform, dredged material transfer pipeline, and associated booster pump platforms for Alternative 1 has the potential to resuspend particles in the project area and the greater San Pablo Bay. Decommissioning the off-loader facility would involve removing the dredged material transfer pipeline and booster pumps and demobilizing the off-loader facility.

Repair and/or replacement of the 26,000 to 28,000-foot dredged material transfer pipeline and securing concrete pads would occur in shallow subtidal water and mudflats adjacent to the HWRP site. Repair and/or replacement of the dredged material transfer pipeline could disturb part or all of the approximate 2.13 ac of subtidal and 0.07 ac of mudflat habitat footprint and could resuspend bottom sediments in the overlying water column. The sediments in the shallow subtidal and mudflat areas predominately consist of fines (silt and clay) and the water is rather shallow; as such, the vertical height of the suspended sediment plume is expected to span from the floor of the Bay to the surface of the water column. Should repair and/or replacement of the booster pump or off-loader platform be necessary, driving support piles may be required. Pile driving could resuspend bottom sediments in the areas of active pile driving.

Since the dredged material transfer pipeline would be located in mudflat habitat with predominately fine-grained sediments, resuspended sediments could be carried with the currents further than coarser sediments. The amount of time the suspended sediment plumes would remain in the water column is a function of the wind-wave action, water currents at the time of construction, and the duration of construction.

As part of the permitting process for the HWRP, the RWQCB issued order R2-2005-0034, which includes waste discharge requirements for construction, operation, and decommissioning the off-loader facility (see Appendix C). The permit also includes limits on a variety of water quality constituents in compliance with Basin Plan standards. With permit compliance, impacts to water quality are considered ***less than significant***. No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Construction of Alternative 2 would require excavation of a 1,000- by 1,500-foot ATF basin dredged to -45 to -60 feet MLLW north of and adjacent to the SF-10 disposal site and excavation of a 250- by 3,000-foot access channel dredged to -32 feet MLLW, should the ATF basin be located in waters too shallow for safe navigation. Activities related to possible replacement of the dredged material transfer pipeline would be similar to Alternative 1.

Initial dredging of proposed ATF basin and access channel would result in approximately 1,600,000 cy and 211,000 cy of material, respectively. Dredging the ATF basin would occur using either a hydraulic cutterhead and/or mechanical clamshell dredge, depending on specific site characteristics within the basin footprint.

During construction of the proposed ATF basin, suspended sediment plumes would be generated by the rotation of the cutterhead. As the cutterhead rotates, it breaks up consolidated sediments and hydraulically guides a slurry of the material (20%) and bay water (80%) into the suction pipe and into a storage scow; during dredging, a suspended sediment plume would be generated along the bottom of the bay floor. Due to the hydraulic action of the dredge, much of the suspended sediment generated in the vicinity of dredging would be sucked into the pipeline with bay water; however, some of the suspended sediment may escape the suction and could be transported with currents. Sediments resuspended during cutterhead dredging have been recorded at distances of 1,000 feet from dredging activities (USACE 1987).

During use of clamshell dredge, a number of processes cause sediment releases to the water column. The pressure wave in front of a descending bucket can stir up sediment prior to its contact with the bottom. As a bucket penetrates into, and is withdrawn from, the bottom, consolidated sediment is liquefied and stirred into the water column. The motion of a muddy bucket during lowering (the down cycle) and raising (the up cycle) can also shed material. Finally, sediment can wash off a muddy bucket when it is dipped through the surface, making it available for transport by wind-driven currents.

Suspended sediment plumes generated during construction of the ATF basin are expected to remain in the lower portion of the water column and be transported with the currents until they settle on the bay floor. However, it is anticipated that much of the suspended sediment would remain within the walls of the ATF basin. This is due to the suspended sediment plume having a horizontal motion along the floor of the basin and the reduced current speeds in the basin as it is deepened. Excavation of the access channel could also expose waters of San Pablo Bay to increased suspended sediment concentrations; however, as with the excavation of the proposed ATF basin, much of the sediment is expected to stay within the walls of the channel.

Maintenance of the proposed ATF would involve dredging approximately 280,000 cy of material from the proposed ATF basin and 120,000 cy from the access channel annually. Material dredged to maintain the proposed ATF basin and access channel would be placed in the ATF basin for beneficial use at the HWRP site.

Prior to excavation of the proposed ATF and access channel, material would be tested to determine its suitability for beneficial use at the HWRP site. Should they comply with the concentrations of constituents outlined in Table 2-4 in Chapter 2, *Description of Alternatives*, material dredged from the ATF basin would be pumped directly to the HWRP site.

Decommissioning the proposed ATF would involve removing the dredged material transfer pipeline and leaving the proposed ATF basin full of dredged material to return it to surrounding elevations. It is anticipated that the access channel would either shoal in naturally, be filled with dredged material, or a combination of the two. Suspended sediment plumes generated during decommissioning are expected to be similar to those discussed for construction of this alternative.

Excavation of the ATF basin and access channel would persist for approximately 3–4 months. During this time, suspended sediment plumes would be generated in the water column surrounding construction and maintenance activities. Suspended sediment concentrations would be highest in the near-field portions of San Pablo Bay, and concentrations would decrease as the plumes are diluted in the far-field areas surrounding excavation (a discussion of near-field and far-field is provided in Section 4.3, *Sediment and Circulation*). Concentrations of suspended sediments could be rather high in the near-field, reaching approximately 1,500 mg/L near the bay floor; however, currents would disperse and dilute the suspended sediment plume until it reaches ambient conditions. It is expected that with implementation of **Mitigation Measure WSQ-MM-1**, potential impacts to water quality resulting from suspended sediments generated during construction, maintenance, and decommissioning this alternative are expected to be ***less than significant***.

Mitigation Measure WSQ-MM-1: Implementation of Best Management Practices.

Implementation of the following Best Management Practices (BMPs) would reduce the potential impacts to water quality during excavation of the ATF basin and access channel:

- Within the mixing zone, suspended sediment concentrations would be allowed to exceed basin standards; however, outside the mixing zone in the far-field areas, suspended sediment concentrations would be required to adhere to the Basin Plan Standards. The near-field and far-field mixing zone distances surrounding dredging activities will be coordinated with the RWQCB prior to excavation activities.
- The contractor will periodically monitor suspended sediment concentrations during excavation to ensure suspended sediment concentrations do not exceed Basin Plan Standards in the far-field areas.
- Implementation of an Environmental Protection Plan for this alternative would outline the BMPs and any monitoring to reduce resuspension of sediments during excavation activities.

Alternative 3: Confined ATF

For the most part, construction activities and associated suspended sediment impacts discussed for Alternative 2 are expected to be the same for Alternative 3, with the following exceptions: for Alternative 3, approximately 125 piles (spaced about 20 feet apart) would be driven into the bay floor around the perimeter of the ATF basin and sheet metal would be installed to provide confining walls around the basin.

Maintenance of the confined ATF would involve dredging approximately 280,000 cy of material from the basin annually and the confining wall structure would be inspected annually. Should periodic inspection indicate damage to the confining wall, portions of it may have to be replaced. As with the Alternatives 1 and 2, the dredged material transfer pipeline may need to be replaced during the life of the project.

Similar to Alternative 2, decommissioning of Alternative 3 would be phased such that when the ATF is no longer needed, the basin will be left full of dredged material. The confining walls and support piles would be removed after the basin is filled. Suspended sediment plumes generated during maintenance and decommissioning of the ATF under this alternative are expected to be similar to plumes generated during construction of Alternative 2.

Excavation of the ATF basin and access channel (should one be required) and driving piles around the basin could resuspend sediments near the floor of San Pablo Bay. Suspended sediment would be entrained in the water column and be transported by currents to other parts of the Bay. This impact is considered potentially significant. With implementation of **Mitigation Measure WSQ-MM-1**, potential impacts to water quality resulting from increased suspended sediment concentrations generated during construction, maintenance, and decommissioning of this alternative would be minimized. This impact is considered ***less than significant***.

Alternative 4 – Direct Channel to BMKV Basin

Construction of Alternative 4 includes construction of a levee around the ATF footprint, excavating an upland 1,000- by 1,500-foot basin at the BMKV site, excavating a 22,300- by 180-foot direct channel with passing lanes from the approximate location of the SF-10 disposal site to the BMKV basin to a depth of -17 feet MLLW. Initial construction of the direct channel would involve dredging approximately 2.0 mcy of material from subtidal/shallow subtidal (119 ac) and tidal mudflat (4 ac) habitats. Once the BMKV basin and direct channel components are constructed, the portion of levee separating the basin from San Pablo Bay would be breached, to allow limited circulation from the Bay into the basin thereby providing for vessel access.

Because construction of the BMKV basin would occur in upland areas, increased suspended sediment is less likely to impact San Pablo Bay, compared to Alternatives 2 and 3. However, dredging the direct channel and breaching the levee to connect the channel to the basin could generate suspended sediments in San Pablo Bay. It is anticipated that sediments dredged from deeper subtidal waters under Alternative 4 would result in suspended sediment plumes that are less concentrated than sediments dredged from the mudflat areas. Suspended sediment plumes resulting from excavation of the direct channel through mudflat habitat are expected to persist for longer and have higher concentrations, due to increased fine-grained material and shallow water wind-wave action.

Breaching the levee to provide access from San Pablo Bay to the BMKV basin would also result in the generation of suspended sediment plumes. However, is anticipated that much of the suspended sediment plume generated from breaching the levee would stay within the boundaries of the BMKV basin and channel.

As with construction of all the other alternatives, suspended sediment generated during construction of Alternative 4 would be entrained in the water column and transported by currents to other parts of San Pablo Bay. This impact is considered potentially significant. With implementation of **Mitigation Measure WSQ-MM-1,** impacts to water quality would be reduced, and this impact would be considered to ***less than significant***.

Impact WSQ-3: Potential to Increase Suspended Sediment Concentrations during Operation

Alternative 1: No Action

Using an off-loader facility to transfer dredged material to the HWRP site would not involve placing dredged material in waters of San Pablo Bay; rather, material would be pumped directly from scows to the dredged material transfer pipeline. It is possible for some dredged material to spill into San Pablo Bay during off-loading; however, the operation of the off-loader facility would include implementation of a spill prevention plan to minimize the potential for suspended sediment to be introduced to the water column. As such, suspended sediment plumes would not be generated; therefore, potential impacts to water quality from increased suspended sediment plumes are considered to be ***less than significant***. No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Scows/tugs and hopper dredges transporting dredged material to the ATF basin begin releasing dredged material into the water column as soon as the scow or hopper doors open. Once released into the water column, the dense plume of material falls to the floor of the ATF basin. As shown on Figure 4.4-1, dredged material falls through the water column in three phases during placement: convective descent, dynamic collapse, and passive transport and dispersion. Convective descent and dynamic collapse are considered near-field mixing and short-term dynamics; whereas passive transport and dispersion are far-field mixing and long-term dynamics subject to background turbulent dispersion and diffusion.

Convective descent describes how dredged material falls through the water column from the point of release to initial contact with the bottom. During this phase, dredged material falls rapidly to the bottom in a high-density sediment plume. Small amounts of dredged material may be stripped from the plume and entrained in the water column as suspended sediments. The remainder of the dredged material spreads along the ATF floor until the momentum is stopped and the sediment settles on the basin floor. Sediment stripped into the water column could be carried by currents until they reach the boundaries of the ATF basin and settle or they settle in other parts of San Pablo Bay. Concentrations of suspended sediment plumes are generally highest near dredged material placement operations (i.e., in the ATF) and decay rapidly as they travel with the currents.

Once the dredged material makes contact with the basin floor, dynamic collapse takes over and the sediment spreads outward as the vertical momentum of the dredged material is transferred to the horizontal momentum. As the dredged material spreads over the floor of the ATF, the slurry of material loses energy and settles on the basin floor. Most of the sediment that is placed in the ATF basin is expected to remain within the basin once the sediment makes contact with the floor.

Passive transport describes how material stripped from the descending plume is transported in the water column. The size of the stripped sediment, critical shear stress (shear stress needed to cause a particle to slip in a given direction), and current velocities determine the rate at which the stripped particles will settle out of the water column.

It takes approximately 2–5 minutes for a hopper dredged or scow to place dredged material, depending on the sediment type and volume of material. Additionally, it is anticipated that 0 to 40 trip/loads of dredged material could access the ATF per day, resulting in approximately 0–200 minutes of dredged material descending through the water column to the basin floor (e.g., 0–200 minutes of convective descent). Suspended sediment concentrations would be highest in the water column above the ATF basin and dissipate as suspended sediment is carried with the currents. Should smaller non-federal projects also place dredged material in the ATF basin, the number of trip/loads would increase, as would the duration of increased suspended sediment concentrations.

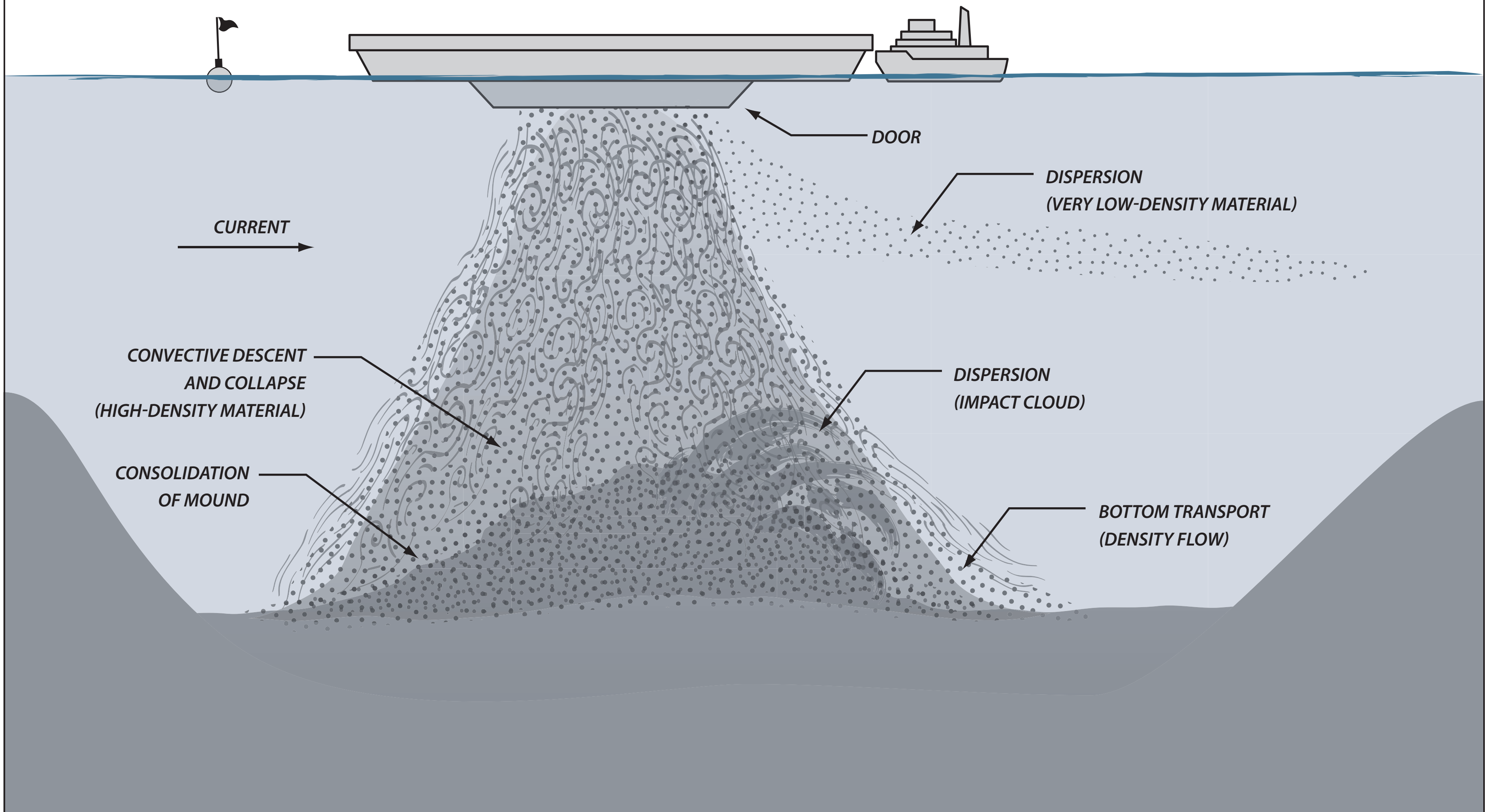
MacWilliams and Cheng (2007) conducted passive tracer plume modeling (using STFATE and UnTrim) to determine the approximate amount of suspended sediment that could be stripped from the descending plume and become entrained in the surrounding water column (as a suspended sediment plume) and how the suspended sediment plume behaves. Results of the modeling indicate that, depending on current velocity, 0–16% of the deposited material could be entrained in the water column. These results provide a conservative total volume of material that could be stripped to the water column, since the model does not account for consolidation of dredged material into aggregates, which has the tendency to reduce the amount of sediment stripped. Results of the passive tracer plume study are provided in Figures 4.4-2 and 4.4-3.

Based on the simulations, during low tide, placement of dredged material is expected to result in a suspended sediment plume that decays to 0.25% below its original concentration, or between 1–7 mg/L above ambient suspended sediment concentrations within five hours of release. It is anticipated the plume would travel approximately 3 mi from the ATF in a north-northeast direction, dissipating in the central portion of San Pablo Bay. During high tide, it is anticipated that the plume would be reduced to below 0.25% of its original concentration (or between 1–7 mg/L above background suspended sediment concentrations) also within five hours of release. The plume is expected to travel approximately 2.5 mi from the ATF in a south-southwest direction, dissipating before reaching San Pablo Strait (MacWilliams and Cheng 2007).

The Basin Plan standard of no greater than a 10% increase in turbidity indicates that turbidity increases greater than 6–12 NTU above ambient conditions, or approximately 9–16 mg/L of suspended sediment, would exceed Basin Plan Standards. Background suspended sediment concentrations in subtidal regions of San Pablo Bay generally range between 80–150 mg/L, which approximates to 60–120 NTU. Background suspended sediment concentrations in the shallow mudflats are generally greater than deeper waters. Shallow water suspended sediment concentrations in areas with predominately fine-grained material, such as the mudflat areas, can reach concentrations of 1,200 mg/L (Buchanan and Ganju 2002). Repeated placement of dredged material in the ATF basin could quickly exceed Basin Plan Standards within the near-field water column surrounding dredged material placement.

The ATF would be situated in the general vicinity of the SF-10 disposal site. Comparisons of suspended sediment concentrations at Point San Pablo during disposal at SF-10 indicated that there is no significant correlation between disposal and suspended sediment concentrations in regions close to the disposal site. Therefore, natural physical processes in San Pablo Bay are believed to be the primary factor controlling suspended sediment concentrations, even during dredged material placement (Schoellhammer 2007, see Appendix A).

Due to the number of expected trips to the ATF in any one day and the resulting increased suspended sediment concentrations in San Pablo Bay, it is anticipated that impacts to water quality resulting from increased suspended sediment concentrations could be a potentially significant impact in the immediate vicinity of the ATF basin. It is important to note that dredged material disposal impacts



Source: Redrawn from ERDC, 2007.

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Figure 4.4-1
Sediment Transport during Dredge Material Placement

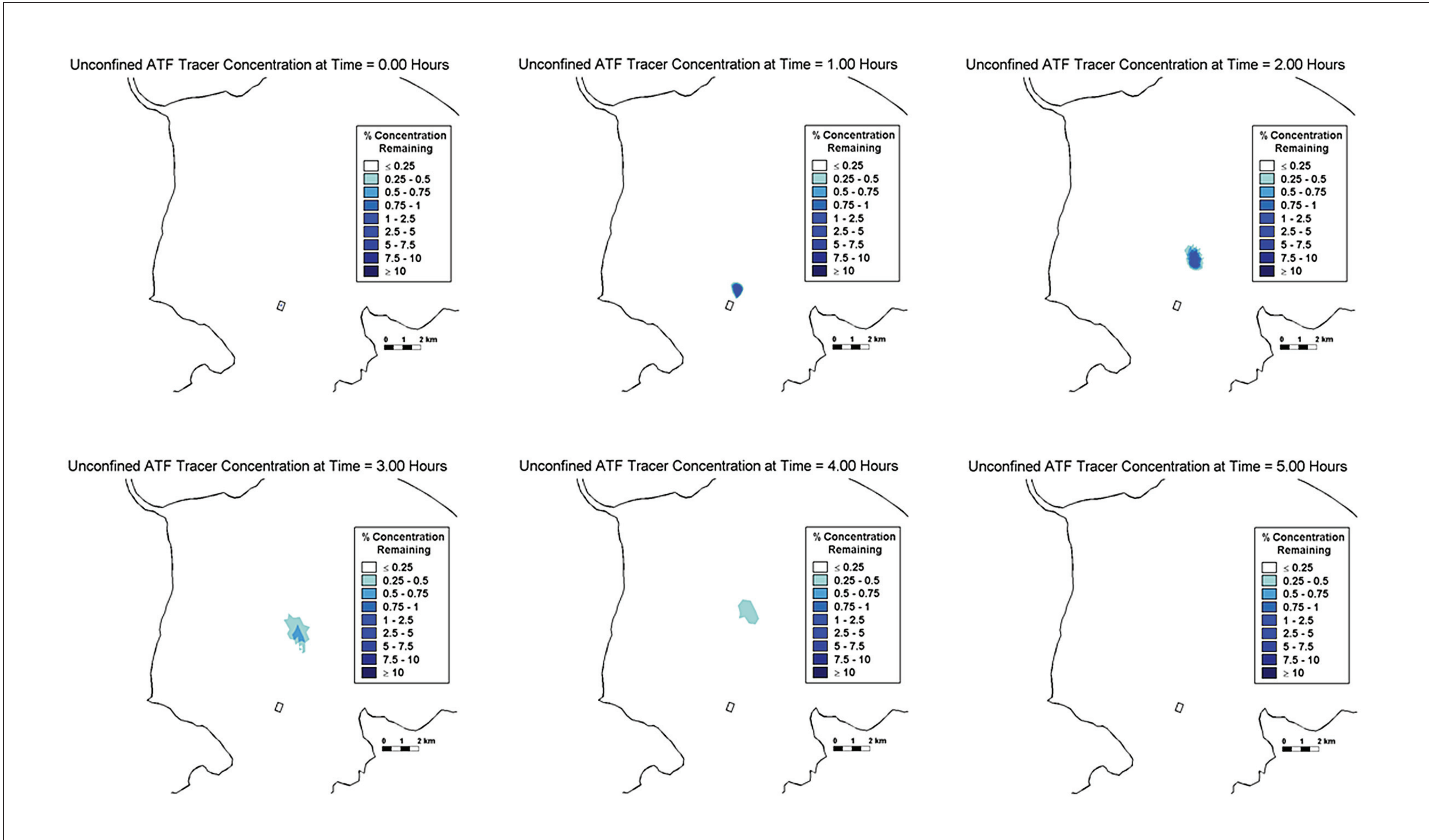

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Figure 4.4-2
Alternative 2 Sediment Plume Transport—Flood Time

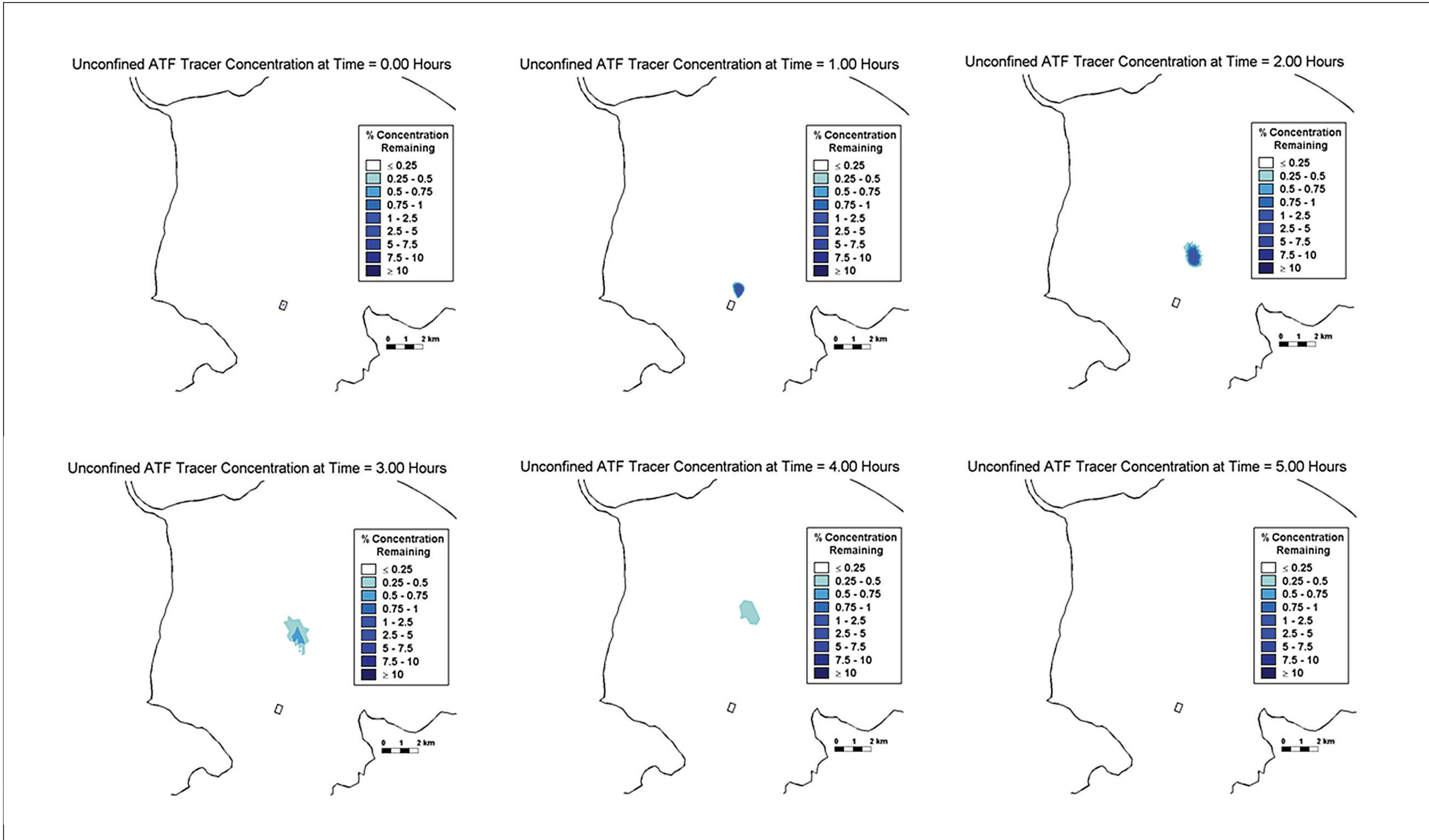

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Figure 4.4-3
Alternative 2 Sediment Plume Transport—Ebb Tide

would be greatly reduced at other in-Bay disposal sites (SF-10, SF-11, SF-9 and SF-16), as dredged material is redirected to from those sites to the ATF for beneficial use at the HWRP site. Further, with the exception of SF-11, which is semi-dispersive, SF-9, SF-10, and SF-16 are 100% dispersive and material disposed of at those in-Bay sites are continually redispersed throughout the Bay, and resuspended in the water column. The ATF basin would be situated in a non-dispersive site, and the proposed capacity of the ATF basin assumes development of an angle of repose of basin perimeter over time, similar to a dredged navigation channel; sediment placed in the ATF basin will naturally redistribute into this additional volume, thus drastically reducing resuspension of sediments and the associated impacts to water quality, compared to existing in-Bay and ocean disposal practices. Even with this reduction, the project potential to increase suspended sediment concentrations during operation could result in potentially significant impacts. With implementation of **Mitigation Measure WSQ-MM-2,** this impact would be considered ***less than significant***.

Mitigation Measure WSQ-MM-2: Monitoring Dredged Material Placement Operations

USACE and Conservancy will periodically monitor dredged material placement operations to ensure that suspended sediment concentrations in the far-field areas do not exceed Basin Plan Standards. Monitoring could include visual inspection of turbidity in the far-field areas and/or deployment of instrumentation to measure suspended sediment and/or turbidity concentrations above ambient conditions. Should suspended sediment concentrations exceed Basin Plan Standards in the far-field mixing zone, dredged material placement operations would be temporarily stopped until the project complies with Basin Plan Standards.

Alternative 3: Confined ATF

Placement of dredged material in the proposed ATF basin could result in suspended sediment plumes being generated similar to Alternative 2. However, the confining walls would mute the velocity of currents within the ATF basin by 0.5–1.0 knot, or more; thus, reducing the amount of sediment that could be stripped from the descending plume. Additionally, the confining walls would drastically limit the amount and concentration of suspended sediment plumes that escape outside the ATF basin, as shown in Figures 4.4-4 and 4.4-5. Within the basin, suspended sediment plumes would remain elevated for longer periods following placement (up to 12 hours or more).

As with the other alternatives, it is anticipated that dredged material disposal impacts would be reduced at other in-Bay disposal sites as dredged material is redirected to from those sites to the confined ATF. Furthermore, the use of confining walls would drastically limit the amount of suspended sediment that could adversely impact water quality throughout San Pablo Bay; as such, this impact is considered ***less than significant***.

Alternative 4: Direct Channel to BMKV Basin

Placement of dredged material in the BMKV basin would also generate suspended sediment plumes. Similar to the confined ATF under Alternative 3, current velocities in the BMKV basin would be less than current velocities in San Pablo Bay, thus resulting in less sediment being stripped from the descending plume and longer residence of suspended sediment plumes in the basin. It is expected that most of the suspended sediment plume would be confined within the BMKV basin itself, since there is limited tidal exchange with San Pablo Bay.

Although placement of dredged material in the BMKV basin would not result in suspended sediment plumes adversely affecting waters of San Pablo Bay, vessel traffic using the direct channel could resuspend sediments during dredged material transport, due to the shallow nature of the direct channel. However, is expected that most of the resuspended sediments would stay within the confines of the direct channel.

As with the other alternatives, it is anticipated that dredged material disposal impacts would be reduced with dredged material being redirected from other in-Bay disposal for placement in the BMKV basin. However, due to limitations of vessel draft (-17-foot maximum), large hopper dredges, such as USACE's *Essayons*, would not be able to access the BMKV basin. Therefore, some dredging projects, such as Pinole Shoals and Richmond Harbor, would not be redirected for beneficial use at the HWRP site.

Overall, the reduction of the In-Bay and Ocean disposal of dredged materials would not result in significant impacts to water quality resulting from increased suspended sediment plumes. Therefore, this impact is considered ***less than significant***. No mitigation is required.

Impact WSQ-4: Potential to Release Constituents of Concern during Construction, Maintenance, and Decommissioning

Chemicals present in sediments exist in two forms: adsorbed (bound to sediment particles) or dissolved in sediment pore water. When sediments are dredged and subsequently placed in aquatic environments, these chemicals can be released into the water column, by release of pore water, chemical partitioning (desorption) from sediment particles, and/or loss of particulate bound constituents of concern, they can stay in their adsorbed or dissolved phases, or they can be transformed into another phase or compound. Transformation of chemicals can be caused by a variety of processes, such as physical agitation, changes in water chemistry, and dilution. Chemical partitioning from particles to the dissolved form can vary, due to several factors, including: particle geometry, concentration, site water chemical concentrations, pH, salinity, fraction of organic carbon in the sediment, and how long sediments are suspended in the water column (Anchor Environmental 2003).

Metals are generally tightly bound to sediment, as such, only small concentrations are dissolved and biologically available. A literature review of the effects of dredging, conducted by Anchor Environmental (2003) indicated that laboratory results and field observations concluded that during dredging, release of dissolved metals from sediments were minimal, even in highly contaminated areas. However, in deeper sediments, such as sediments underlying the ATF basin, sediments are anoxic and release of metals can increase; however, most metals are captured by sulfides formed by the reduction of sulfate. At the transition zone between anoxic and aerobic sediments, metals can often become soluble, thus increasing the potential for metals to be released in the water column. Due to these processes, as suspended sediments are released into the water column, the total concentration of metals can be large; however concentrations of dissolved metals are generally low and of short duration (Anchor Environmental 2003).

Organic compounds (e.g., polychlorinated biphenyls [PCBs], polycyclic aromatic hydrocarbons [PAHs] and pesticides), on the other hand, are often hydrophobic and, therefore, have limited solubility in water. When sediments containing organic compounds are resuspended, some of the organic compounds are desorbed and diffuse in the water column. Field observations indicate that releases of organics into the water column are generally small, compared to the diluting effect of the

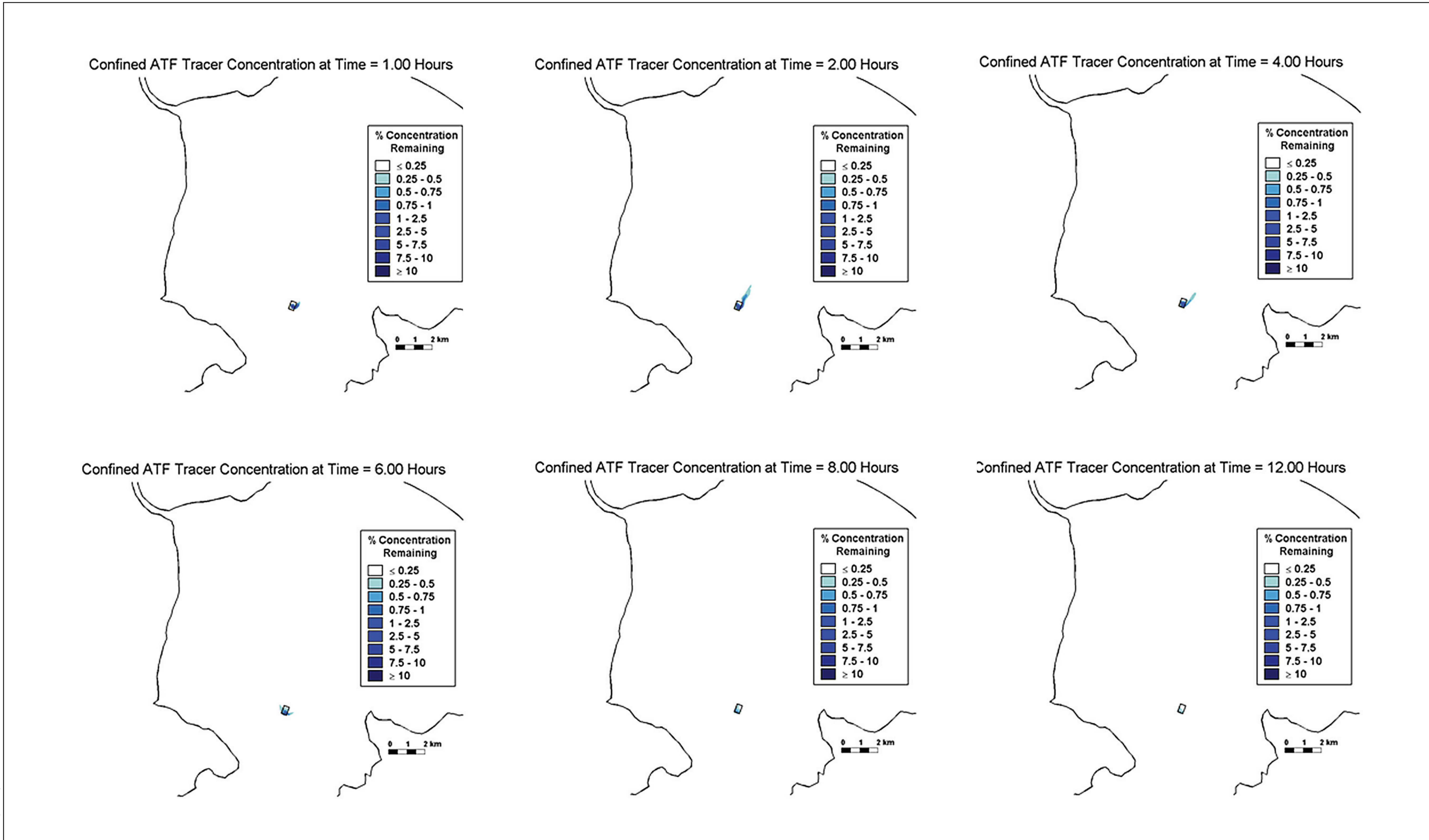

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Figure 4.4-4
Alternative 3 Sediment Plume Transport—Flood Tide

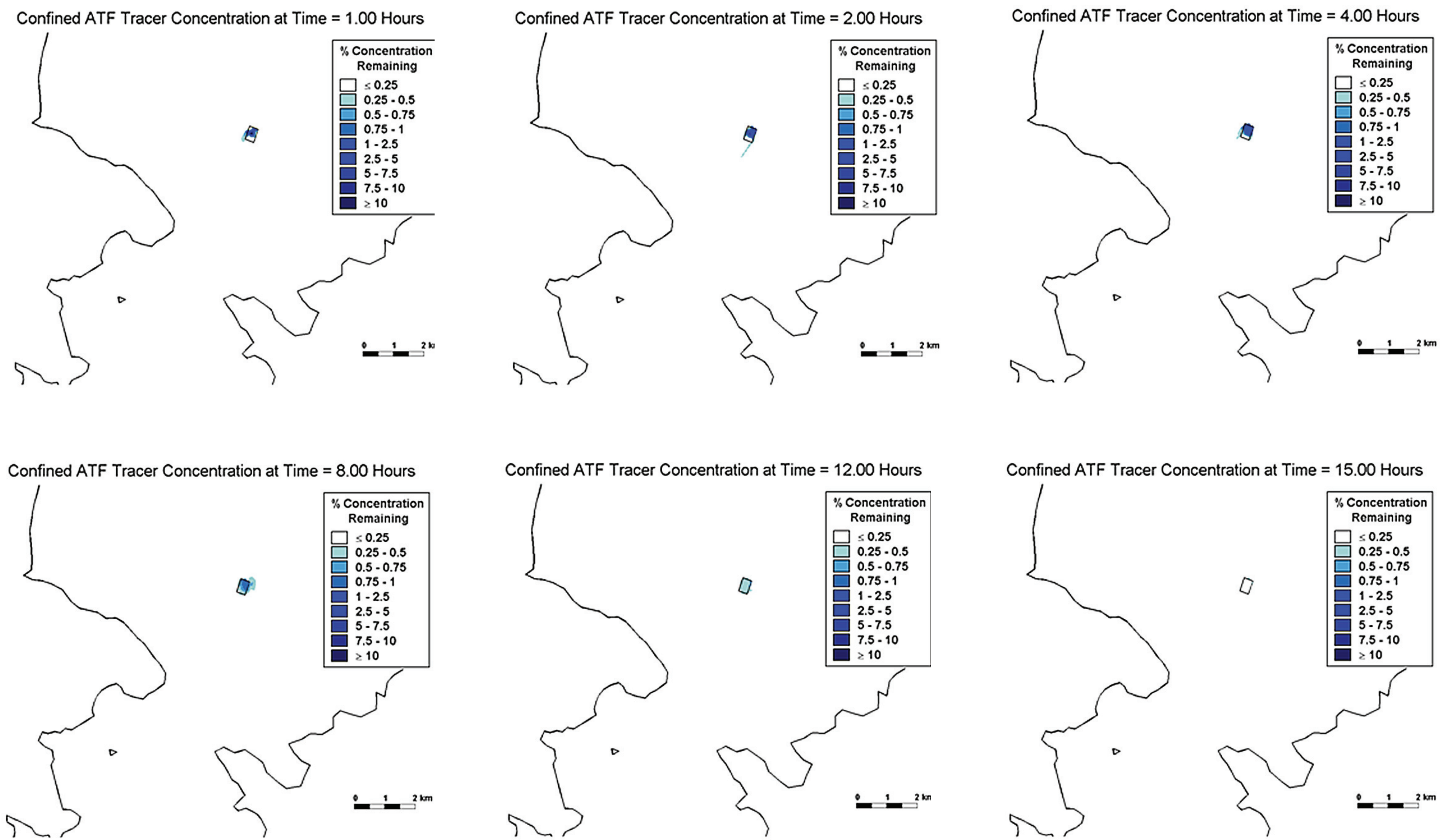

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Figure 4.4-5
Alternative 3 Sediment Plume Transport—Ebb Tide

larger body of water and changes in water quality were often transient, even in areas with high organic compound contamination (Anchor Environmental 2003).

As discussed in Table 3.4-1, San Pablo Bay waters are known to contain elevated levels of Chlordane, dichloro-diphenyl-trichloroethane (DDT), Dieldrin, Dioxin compounds, mercury, nickel, PCBs and selenium (Clean Water Act [CWA] 303 List).

Alternative 1: No Action

Maintenance and decommissioning aspects of Alternative 1 that could result in release of constituents of concern to the water column include disturbance of sediments during replacement and/or maintenance of the dredged material transfer pipeline and off-loader platform and removing the pilings and dredged material transfer pipeline following completion of the HWRP.

Depending on the concentrations of constituents of concern in the sediment within the footprint of the dredged material transfer pipeline and the off-loader facility (where piles may be replaced), resuspended sediments have the potential to release associated constituents of concern into the water column. However, as discussed previously in this section, release of constituents of concern from sediments and sediment pore water is generally minimal due to the tightly bound nature of these constituents to sediment particles. Sediment plumes generated from construction, maintenance and decommissioning activities could also be transported to other parts of San Pablo Bay, potentially exposing cleaner sediment to constituents of concern.

Construction, maintenance, and decommissioning activities associated with Alternative 1 could agitate and resuspend bottom sediments. These activities would be limited spatially and temporally, affecting approximately 2.2 ac of subtidal and tidal habitat for the installation of the pipeline and very small footprint for driving piles and only persisting during excavation, pile driving, and removal of the pipeline and piles. Further, construction, maintenance, and decommissioning activities would comply with the permit issued by the RWQCB. As such, it is anticipated that potential release of constituents of concern into the water column and subsequent settling in other areas of San Pablo Bay would not result in potentially significant impacts on water and sediment quality. Therefore, this impact is considered to be less than significant. No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Construction, maintenance, and decommissioning components of Alternative 2 that could results in the release of constituents of concern would to be the same as those components discussed for this alternative under **Impact WSQ-2**.

As discussed in Section 3.4, *Water and Sediment Quality*, the area identified as the potential location of the ATF basin could be underlain with Hydraulic Mining Debris (HMD), which may contain elevated levels of mercury. The sedimentation and erosion model estimated the volume of HMD within the potential locations for the ATF range from 4,000–131,000 cy (approximately 0.25 and 8.2% of the total amount excavated for construction of the ATF basin, respectively), with concentrations of mercury ranging from 0.3–0.6 micrograms per gram (μg/g), depending on the exact location chosen. It is anticipated that sediments beneath and above the HMD layer could have mercury concentrations similar to background levels (Jaffe and Fregoso 2007).

In addition to HMD, other constituents of concern may be present in the sediments that would be excavated for construction of the ATF. For example, PCBs were heavily used from the 1930s to

1970s. In 1979, the federal government put a ban on the sale and production of this substance because of increasing PCB concentrations in water bodies. Since the ban, concentrations within the Bay have declined; however, they are still a major concern in the Bay Area since they are a highly potent toxicant that is resistant to degradation and tends to bioaccumulate in organisms (SFEI 2006). Based on modeling used to simulate sedimentation in San Pablo Bay and determine the approximate locations and depths of HMD layers, it is reasonable to assume that other constituents of concern used extensively in the past, such as PCBs, may be sequestered in the sediments within the ATF footprint. In this analysis, it is assumed that sediment deposited in San Pablo Bay prior to the hydraulic mining and industrialization eras are clean (Jaffe and Fregoso 2007).

Due to the uncertainty of which constituents of concern exist within the ATF basin, the extent of impacts to water and sediment quality resulting from release of constituents of concern could be potentially significant. However, with implementation of **Mitigation Measure WSQ-MM-3**, impacts to water and sediment quality from the release of constituents of concern due to construction, maintenance, and decommissioning the unconfined ATF are considered ***less than significant***.

Mitigation Measure WSQ-MM-3: Preparation and Approval of a Sediment Sampling and Analysis Plan (SAP)

Prior to exact site selection and excavation of the proposed ATF basin, access channel and dredged material transfer pipeline, a sediment sampling and analysis plan will be prepared and approved by the Dredged Material Management Office (DMMO) (including USACE, U.S. Environmental Protection Agency [EPA], San Francisco Bay Conservation and Development Commission [BCDC], RWQCB, National Oceanic and Atmospheric Administration [NOAA] Fisheries, U.S. Fish and Wildlife Service [USFWS], and California Department of Fish and Game [CDFG]). Recommendations from the above-listed agencies and BMPs will be incorporated to ensure the risk of release of any constituent of concern into the water column is reduced. Recommendations and BMPs could include use of an environmental bucket to remove potentially contaminated sediments and disposal at an approved site (e.g., SF-DODS, upland site, or a rehandling facility).

Alternative 3: Confined ATF

Mechanisms for release of constituents of concern during construction, maintenance, and decommissioning of the unconfined ATF basin under Alternative 3 would be similar to those discussed under Alternative 2. In comparison to Alternative 2, however, the confining walls would limit the amount of resuspended sediments and subsequent release of constituents of concern exposed to San Pablo Bay waters. Additionally, implementation of **Mitigation Measure WSQ-MM-3** would reduce the potential impacts to water and sediment quality. Therefore, this impact is considered ***less than significant***.

Alternative 4: Direct Channel to BMKV Basin

Release of constituents of concern associated with construction, maintenance, and operation of Alternative 4 would be similar to the mechanisms discussed under **Impact WSQ-2** for this alternative. Although the BMKV basin would be constructed in an upland environment, the direct channel would be excavated in San Pablo Bay and would also require preparation and approval of a sediment testing plan to reduce the potential for constituents of concern to be released into the water column. Additionally, implementation of **Mitigation Measure WSQ-MM-3** would reduce the potential impacts to water and sediment quality resulting from the release of constituents of concern. Therefore, this impact is considered ***less than significant***.

Impact WSQ-5: Potential to Degrade Water Quality due to Increased Methylmercury Formation

As previously discussed, there is a high likelihood for the presence of a HMD layer within the proposed ATF sites that is estimated to contain elevated levels of mercury (0.3–0.6 µg/g) underlying San Pablo Bay. Mercury in the HMD layer is in an insoluble form; however, once exposed to the water column, it can be transformed by methylating bacteria into methylmercury. Methylmercury is formed at the sediment-water interface, but a significantly larger concentration of methylmercury is formed in marsh areas, compared to open water. Activities that lower pH, oxidize sediments and attract sulfate-reducing bacteria, or increase the methylation and demethylation of mercury could increase the concentration of methylmercury available for uptake by aquatic organisms.

Methylation of mercury is not limited by the amount of total mercury available, rather methylating bacteria and the redox potential of the surrounding environment determine how much mercury could be methylated (mercury available for methylation is referred to as 'reactive mercury') (Marvin-DiPasquali 2008). Marvin-DiPasquali and Cox (USGS) conducted legacy mercury studies in Alviso Slough for the South Bay Salt Pond Restoration Project (near San Jose, California). Alviso Slough is within close proximity to the New Almanden mercury mining district. Sediments sampled in the South Bay have higher concentrations of mercury, due to the close proximity to mining operations. Mercury in the San Pablo Bay HMD layer is expected to have much lower concentrations than those found in the South Bay, since the mercury came from gold mining in the Sierra Mountain Range and mercury-laden sediments were flushed to San Pablo Bay in rivers and streams, rather than a near-by mercury mine (Marvin-Dipasquali 2008).

Results of this study indicate that immediately following exposure of buried mercury to the sediment-water interface, methylation of mercury happens rapidly and concentrations of methylmercury increase in the immediate vicinity of mercury exposure. However, shortly after exposure, methylmercury demethylated quickly, reactive mercury levels decreased, and methylmercury levels returned to pre-dredging concentrations (Marvin-DiPasquali 2008).

Alternative 1: No Action

Because Alternative 1 would not involve dredging areas with HMD, it is anticipated that construction, maintenance, and decommissioning this alternative would not result in significant impacts to water and sediment quality resulting from methylmercury formation. As such, this impact is considered ***less than significant***. No mitigation is required.

Alternatives 2 and 3

Excavation of the ATF basin could expose mercury-laden sediments to the sediment-water interface, which could result in increased methylmercury concentrations in the vicinity of active dredging. As discussed above, methylmercury production would occur rapidly, once mercury is exposed to oxygenated waters and methylating bacteria; however, methylmercury would quickly demethylate to inorganic mercury. As discussed in **Mitigation Measure WSQ-MM-3**, a sediment sampling and plan would be prepared and approved by the DMMO agencies prior to excavation of the ATF. The sediment testing plan would include plans for testing of sediments for mercury, a methylmercury management plan, and environmental safe methods to excavate mercury-laden sediments and dispose them in a pre-approved site (i.e., in-Bay, SF-DODS, or upland) should mercury concentrations be elevated above the levels specified in Table 2-4 (0.43 µg/g). As such, implementation of **Mitigation**

Measure WSQ-3 is expected to reduce potential impacts to water quality resulting from methylmercury production during excavation of the ATF. Therefore, this impact is considered ***less than significant***.

Alternative 4: Direct Channel to BMKV Basin

Although modeling was not conducted for this alternative, should the footprint of this alternative be underlain with HMD, construction of Alternative 4 could expose mercury to the water column. Implementation of **Mitigation Measure WSQ-MM-3** would reduce potential impacts to water quality resulting from methylmercury production during excavation of the BMKV basin. This impact is considered ***less than significant***.

Impact WSQ-6: Potential to Release Constituents of Concern during Operation

Alternative 1: No Action

As discussed in WSQ-2 for this Alternative, the off-loader facility would not involve placement of dredged into San Pablo Bay waters. Further, this alternative complies with the existing National Pollutant Discharge Elimination System (NPDES) permit conditions issued by the RWQCB to ensure that water quality standards are met by project activities. As such, impacts to water and sediment quality resulting from release of constituents of concern during operation of this proposed action are considered ***less than significant***. No mitigation is required.

Alternatives 2 and Alternative 3

As discussed, operation of the proposed in-Bay ATF would involve placement of dredged material in the basin for subsequent transfer to the HWRP site. The controlling factors for release of constituents of concern would be the redox potential and pH of the water in the vicinity of dredged material placement and, to a lesser degree, salinity (Pequegnat 1983) (redox potential refers to the reduction-oxidation potential, which is a measure of the availability and activity of oxygen to enter into and control chemical reactions). Dredged material containing fine-grained sediment has the highest affinity for several classes of constituents of concern, such as trace metals and organics, and tend to remain in the water column longer than larger particles, due to their low setting velocities. Oxygen in the water would promote the oxidation of the organic substances in the suspended materials. This, in turn, can release some dissolved constituents of concern, particularly sulfides (United States Navy 1990). However, as discussed, most constituents of concern are tightly bound to sediments and are not easily released during short-term resuspension (Anchor Environmental 2003).

Dredged material placed at the proposed in-Bay ATF basin must comply with the constituents of concern concentration limits provided by the USFWS and RWQCB permits (see Table 2-4). Compliance with these constituents of concern concentration limits would ensure placement of dredged material into the ATF basin would not result in water or sediment quality degradation due to release of constituents of concern. As such, this impact is considered ***less than significant***. No mitigation is required.

Alternative 4 – Direct Channel to BMKV Basin

Operation of Alternative 4 would not involve the placement of dredged material into San Pablo Bay; however, it is anticipated that a very small portion of suspended sediment plumes would escape to

San Pablo Bay waters through the breach in the perimeter levee. Transporting dredged material to the BMKV basin would also agitate sediments within the access channel; however, agitated sediments are not expected to contain elevated levels of constituents of concern beyond the concentrations of the surrounding sediments. As such, potential impacts to water and sediment quality resulting from release of constituents of concern during operation of Alternative 4 is considered ***less than significant***. No mitigation is required.

Impact WSQ-7: Potential to Reduce Dissolved Oxygen Levels

Dissolved oxygen is a basic requirement for a healthy aquatic ecosystem. Depending on the dredging method used and the composition of material dredged, dissolved oxygen concentrations in the water column can be reduced during dredging if the resuspended sediment contains high concentrations of oxygen demanding substance (e.g., reduced sulfides and iron). The reduction of oxygen surrounding dredging operations occurs as anoxic sediments and associated reduced compounds (compounds stripped of oxygen) become suspended in the water column; the reduced compounds bind with oxygen, thus reducing the amount of oxygen available for organisms.

Generally, dredging activities result in a minimal and temporary reduction of dissolved oxygen that is minimal (1–2 parts per million [ppm]), persisting until the suspended sediment settles out of the water column (USACE 1989). Surface waters tend to return to ambient dissolved oxygen levels shortly after dredging ceases; however, dissolved oxygen reduction in bottom waters is generally more significant (a reduction of up to 6 ppm for 4–8 minutes).

In areas more heavily influenced by tidal action and/or sandy material, dissolved oxygen concentrations generally return to ambient concentrations shortly after dredging ceases. Areas with fine-grained material, less tidal influence, and/or increased sediment contamination, experience greater reduced dissolved oxygen concentrations for longer periods (USACE 1989).

Alternative 1: No Action

For Alternative 1, the mechanisms that could reduce dissolved oxygen include excavation of the dredged material transfer pipeline trench, replacement of the pipeline, decommissioning the pipeline and pile driving. Pipeline construction activities (including replacement and decommissioning) would occur in subtidal, shallow subtidal and mudflat habitats. Mudflat habitats of San Pablo Bay consist of fine-grained clay and silts and are known to contain high quantities of biota. During construction of the pipeline, fine-grained sediments would be resuspended in the water column. Reduced compounds in the sediment would combine with dissolved oxygen and reduce the surrounding dissolved oxygen in the water. Operation of Alternative 1, however, is not expected to reduce dissolved oxygen levels.

Based on this assessment, it is anticipated that impacts to water quality resulting from reduced dissolved oxygen levels during construction of Alternative 1 would be minimal. Therefore, this impact is considered to be ***less than significant***. No mitigation is required.

Alternatives 2 and 3

Construction, maintenance, operation, and decommissioning Alternatives 2 and 3 would reduce oxygen in the water column surrounding the in-Bay ATF site. Excavation of the ATF basin and access channel would expose anoxic sediments to the surrounding water column for 3–4 months. As anoxic sediments are exposed to the water column, resuspended reduced compounds could bind with dissolved oxygen making oxygen less available for aquatic organisms. As the ATF basin is deepened, a majority of the suspended sediments are expected to stay within the basin, potentially reducing dissolved oxygen within the basin. Dissolved oxygen concentrations in waters outside the ATF basin are not expected to be reduced to levels that could adversely impact aquatic organisms, since currents would transport the suspended sediment to other parts of San Pablo Bay, thus keeping the waters oxygenated (United States Navy 1990).

Reduced dissolved oxygen concentrations resulting from construction, maintenance and decommissioning the dredged material transfer pipeline is expected to be similar to the impacts discussed under Alternative 1.

Placing dredged material in the ATF basin could temporarily reduced dissolved oxygen as well; however, material from dredging projects is agitated during dredging and not reduced, therefore, decreases in dissolved oxygen levels is expected to be minimal and temporary, persisting for minutes only (United States Navy 1990).

As indicated, the largest reduction in dissolved oxygen would occur during construction excavation of the ATF basin and, to a lesser extent, the access channel, and the potential reduction of dissolved oxygen levels is expected to persist only during the 3–4 months of construction. Potential impacts to water quality resulting from a reduction in dissolved oxygen during maintenance, operation, and decommissioning the ATF is also expected to be minimal and temporary, since much of the sediments disturbed during maintenance dredging of the basin and access channel and the sediments placed in the ATF basin during operation would be oxygenated. As such, this impact is considered to be ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Construction and maintenance of the direct channel would be the mechanisms that could reduce dissolved oxygen in the project footprint. As with construction of the dredged material transfer pipeline, excavation of the direct channel would occur in mudflat habitats with fine-grained material and high levels of oxygen demanding substances. However, potential impacts to water quality resulting from a reduction in dissolved oxygen during construction and maintenance of the direct channel is expected to be minimal and temporary, persisting only around active dredging. When the dredge moves to another part of the proposed channel to excavate and maintain, it is expected that areas previously impacted by reduced dissolved oxygen levels would quickly return to ambient conditions. As such, this impact is considered ***less than significant***. No mitigation is required.

Impact WSQ-8: Potential to Impact Nutrient Loads

Nutrient enrichment can increase turbidity in the water column by enhancing the growth of phytoplankton. During dredging operations, nutrient enrichment it is typically a transient phenomenon with minimal local impacts. In project areas that are more tidally influenced, such as the proposed ATF site near SF-10, nutrients would be diluted and flushed out of the project area by tidal currents; however, in areas where waters are shallower and/or experience less tidal influence, such as the mudflat areas of San Pablo Bay, nutrients are expected to remain in the water column longer. Additionally, nutrients have an affinity for fine-grained sediments; in areas where sediments are predominately fine-grained, nutrient enrichment resulting from resuspension of nutrient-rich sediments has the potential to persist for longer periods (United States Navy 1990).

Alternative 1: No Action

Maintenance and decommissioning of the dredged material transfer pipeline and driving piles for the off-loader facility and booster pumps would resuspend sediments, including fine-grained sediments in mudflat habitat, in the project area. As sediments are resuspended, nutrients could be exposed to the water column. Although this could cause a temporary increase in phytoplankton growth, light would be limiting, due to increased suspended sediment plumes generated in the vicinity of construction and maintenance activities. Increases in nutrient loads during construction, maintenance, and decommissioning of this alternative is expected to be minimal, localized around active excavation and pile driving activities, and temporary. As such, this impact is considered to be ***less than significant***. No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Nutrient enrichment resulting from construction, maintenance, operation and decommissioning Alternative 2 could occur during excavation of the basin, access channel, and dredged material transfer pipeline trench, maintenance dredging of the basin and access channel, replacing the pipeline, and placement of dredged material. Although phytoplankton growth could occur, due to suspended sediment plumes generated during construction, maintenance, and placement of dredged material in the ATF basin, any growth would be limited by light availability. Additionally, the project area is located in waters with strong tidal influence (except for the area where the dredged material transfer pipeline would be located) any increase in nutrient loads resulting from construction, maintenance, and decommissioning of the ATF basin and access channel is expected to be small and flushed with tidal currents.

Potential impacts to water quality resulting from nutrient enrichment during construction, maintenance, operation, and decommissioning Alternative 2 are considered ***less than significant***. No mitigation is required.

Alternative 3: Confined ATF

The mechanisms that could cause nutrient enrichment during construction, maintenance, operation, and decommissioning of Alternative 3 would be similar to those discussed for Alternative 2; except flushing nutrients from the confined ATF during construction and operation of this alternative would be limited, due to the confining walls. Because resuspended sediments would be suspended in the waters within the confinement for longer periods, phytoplankton growth would be severely limited. As such, this impact is considered to be ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Construction and maintenance of the direct channel, and to a much lesser extent, breaching the levee to allow access to the BMKV basin and operational placement of dredged material could release nutrients to the water column. Similar to the other alternatives, increased suspended sediment plumes would limit phytoplankton growth and associated impacts that can occur with increased nutrient loads. As such, this impact is considered to be ***less than significant***. No mitigation is required.

Section 4.5

Potential Impacts to Marine and Terrestrial Biological Resources

4.5.1 Methodology for Impact Analysis

Direct and indirect impacts to existing marine and terrestrial biological resources, including aquatic and terrestrial habitat, fish, birds, wildlife, and plant species, were evaluated by comparing the quantity and quality of each habitat type under existing conditions to the construction, maintenance, operation, and decommissioning of each alternative. The baseline condition for all impacts discussed in this section consists of the existing habitats and their overall value to the local and regional ecosystem in San Pablo Bay and at the HWRP site. The impact analysis takes into account the amount and quality of the habitat available with and without the project. The existing marine and terrestrial environment is discussed in Section 3.5.

Several assumptions were used in this analysis to determine potential impacts to marine and terrestrial biological resources. Predictions of future conditions are based on the amount of habitat disturbed as well as the predicted rates of sediment accumulation and dispersion, and the commensurate impacts of those changes to biological resources.

4.5.2 Potential Impact Mechanisms

- Maintenance and/or replacement of an approximately 28,000 feet dredged material transfer pipeline and pile driving for booster pump platforms, should maintenance and/or replacement of the pipeline be required (Alternatives 1, 2, and 3);
- Maintenance and/or replacement of piles for the dredged material off-loader facility (which would result in pile driving), should it be required (Alternative 1);
- Excavation of a 1,000- by 1,500-foot ATF basin in San Pablo Bay and a 3,000 by 250-foot access channel, should the basin be in waters too shallow for safe navigation (Alternatives 2 and 3);
- Excavation of a 1,000- by 1,500-foot basin on the BMKV site and a 22,300-foot direct access channel (Alternative 4);
- Driving piles to support the confining wall and installation of the confining walls (Alternative 3);
- Operational placement of dredged material in an in-Bay ATF basin in San Pablo Bay (Alternatives 2 and 3), or adjacent to San Pablo Bay on the BMKV site (Alternative 4);

- Direct injury to fish resulting from use of construction and operation equipment (e.g., propeller strikes, entrainment in dredge or water intake equipment, entrainment in dredged material plumes, etc.) (all Alternatives);

- Indirect loss or degradation of habitat resulting from changes in water quality (e.g., increased suspended solids and turbidity, release of constituents of concern, decreased dissolved oxygen and other parameters) (all Alternatives);

- Acoustic shock from driving piles, resulting in either direct mortality or degradation of species fitness (Alternatives 1, 2, and 3 for booster pumps, Alternative 1 for the off-loader facility platform pile driving, and Alternative 3 during construction of the confining walls); and

- Decommissioning of the facilities including removal of the off-loader facility platform (Alternative 1), the pipeline and booster pumps (Alternatives 1, 2, and 3), grading of levees (Alternative 4), and placement of dredged material (Alternatives 2, 3, and 4).

4.5.3 Thresholds of Significance

For the purposes of this analysis, an impact was considered to be significant and to require mitigation if it would:

- A substantial adverse effect, either directly or through habitat modification, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations or by the CDFG, NOAA-Fisheries, or the USFWS;

- A substantial adverse effect on federally protected wetlands, as defined by the CWA Section 404 (including marsh, vernal pool, and coastal wetlands) through direct removal, filling, hydrological interruption, or other means;

- Interference with the movement of any native resident or migratory wildlife corridor, or impede the use of native wildlife nursery sites that would adversely affect population structures of a species;

- Conflicts with local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or

- Conflicts with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan.

In addition to adopting the CEQA Guidelines to determine thresholds of significance, this document also applies standard of professional practice to determine the level of significance of an impact on biological resources. Additional parameters used to determine the level of significance include:

- Documented scarcity and sensitivity of a species, either locally or regionally;

- Decreased local or regional distribution of common or sensitive biological resources;

- Long-term degradation of a sensitive plant community through substantial alternation of land forms or site conditions;
- Substantial loss of sensitive plant community and associated wildlife habitat; fragmentation or isolation of wildlife habitats and movement corridors (especially riparian and wetland communities);
- Substantial disturbance of wildlife by human activities;
- Biologically important habitat being avoided by fish for substantial periods that could lead to mortality or reduced fitness; and/or
- Substantial reduction in population size, attributable to direct mortality or habitat loss, lowered reproductive success, or habitat fragmentation of any federal or state protected species.

4.5.4 Impacts and Mitigation Measures

The following table summarizes the impacts and the significance determinations for each of the alternatives, relative to Marine and Terrestrial Biological Resources.

Table 4.5-1. Summary of Marine and Terrestrial Biology Impacts

Impacts	Alternative 1 – Dredged Material Off-loader Facility (No Action)	Alternative 2: Unconfined ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact MTB-1: Entrainment in Dredge Equipment during Construction Excavation, Maintenance Dredging and Operational Dredged Material Removal.	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms** Less than significant	**Green and White Sturgeon:** Significant and unavoidable **Salmonids:** Less than significant with mitigation **Groundfish, Mid-Water Fish, and Benthic Organisms:** Less than significant	**Green and White Sturgeon:** Significant and unavoidable **Salmonids:** Less than significant with mitigation **Groundfish, Mid-Water Fish, and Benthic Organisms:** Less than significant	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Significant and unavoidable

Impacts	Alternative 1 – Dredged Material Off-loader Facility (No Action)	Alternative 2: Unconfined ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact MTB-2: Entrainment and Burial of Green Sturgeon, Salmonids, Groundfish, and Mid-Water Fish Species in Descending Dredged Material Plume during Operational Dredged Material Placement	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant with mitigation	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant
Impact MTB-3: Injury or Mortality from Propeller Strikes, Vessel Collision, and/or Entrainment in Prop Wash during Construction, Maintenance, Operation, and Decommissioning.	**Marine Mammals:** No impact **Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant with mitigation	**Marine Mammals:** No impact **Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant	**Marine Mammals:** No impact **Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant	**Marine Mammals:** No impact **Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Significant and unavoidable. Mitigation proposed
Impact MTB-4: Impacts to Aquatic Organisms Resulting from Contact with Resuspended Sediment Plumes.	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant with mitigation **Benthic Organisms:** Less than significant	**Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant	**Green Sturgeon, Salmonids, Groundfish, and Mid-Water Fish:** Significant and unavoidable, Mitigation proposed **Benthic Organisms:** Less than significant
Impact MTB-5: Impact to Aquatic Organisms Resulting from Contact with and Bioaccumulation of Constituents of Concern Released during Construction, Maintenance, Operation, and Decommissioning	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant with mitigation	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant with mitigation	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant with mitigation

Impacts	**Alternative 1 – Dredged Material Off-loader Facility (No Action)**	**Alternative 2: Unconfined ATF (Proposed Action)**	**Alternative 3: Confined In-Bay ATF**	**Alternative 4: Direct Channel to BMKV Basin**
Impact MTB-6: Impacts to Aquatic Organisms Resulting from Pile-Driving Generated Noise	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Marine Mammals:** Less than significant With Mitigation	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Marine Mammals:** Less than significant With Mitigation	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Marine Mammals:** Significant and Unavoidable Mitigation proposed	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Marine Mammals:** No impact
Impact MTB-7: Loss or Disturbance of Subtidal, Intertidal, Mudflat, and Marsh Habitats and Associated Foraging, Spawning, Rearing, and Migration Habitats	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Significant and unavoidable, Mitigation Proposed
Impact MTB-8: Increased Predation on Aquatic Organisms	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant	**Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish, Benthic Organisms:** Less than significant
Impact MTB-9: Impacts to Food Web	Less than significant	Less than significant	Less than significant	Less than significant
Impact MTB-10: Loss of Eelgrass Habitat	Less than significant	Less than significant	Less than significant	Less than significant
Impact MTB-11: Indirect Impacts to Aquatic Organisms from Accidental Petroleum Spills or Dredged Material Transfer Pipeline Leak	Less than significant	Less than significant	Less than significant	Less than significant
Impact MTB-12: Disturbance to Nesting Birds during Construction, Maintenance, Operation, and Decommissioning	No impact	No impact	No impact	Less than significant with Mitigation

Impacts	Alternative 1 – Dredged Material Off-loader Facility (No Action)	Alternative 2: Unconfined ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact MTB-13: Temporary Loss (9 – 18 Years) of Foraging Habitat for Shorebirds, California Clapper Rail, and California Black Rail during Construction, Maintenance, Operation, and Decommissioning	Less than significant	Less than significant	Less than significant	Significant and Unavoidable (shorebirds only)
Impact MTB-14: Temporary Loss (9 – 18 Years) of Foraging Habitat for Upland Birds, Including the San Pablo Song Sparrow, Saltmarsh Common Yellowthroat, Burrowing Owl, and Northern Harrier during Construction, Maintenance, Operation, and Decommissioning	Less than significant	Less than significant	Less than significant	Less than significant
Impact MTB-15: Disturbance to Bird Species due to Project-Related Noise	Less than significant with mitigation	Less than significant with mitigation	Less than significant with mitigation	Less than significant with mitigation
Impact MTB-16: Short-term (9 – 18 Years) Loss and/or Degradation of Tidal Mudflat Habitat during Construction, Maintenance, Operation, and Decommissioning	Less than significant	Less than significant	Less than significant	Significant and unavoidable
Impact MTB-17: Short-term (9 – 18 Years) Loss and/or Degradation of Tidal Salt Marsh Habitat during Construction, Maintenance, Operation, and Decommissioning	No Impact	No Impact	No Impact	No Impact
Impact MTB-18: Loss of Special-Status Plant Species and/or Habitat for Special-Status Plant Species during Construction, Operation, Maintenance, and Decommissioning	No impact	No impact	No impact	No impact
Impact MTB-19: Short-term (9 – 18 Years) Loss of Upland Habitats, Including Agricultural Land and Non-Tidal Wetlands	Less than significant	Less than significant	Less than significant	Less than significant

Impacts	Alternative 1 – Dredged Material Off-loader Facility (No Action)	Alternative 2: Unconfined ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact MTB-20: Indirect Degradation of Tidal Mudflat and Tidal Salt Marsh Habitat Resulting from Uptake of Mercury by Vegetation due to Project Construction and Maintenance during Construction, Operation, Maintenance, and Decommissioning	Less than significant	Less than significant	Less than significant	Less than significant
Impact MTB-21: Introduction or Spread of Noxious Weeds due to Project Construction and Maintenance during Construction, Operations, Maintenance, and Decommissioning	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation	Less than significant with Mitigation
Impact MTB-22: Compliance with the Goals of the CCMP and San Francisco Bay LTMS	Beneficial	Beneficial	Beneficial	Beneficial

4.5.4.1 Impacts on Aquatic Organisms and Habitat

Life history and abundance of aquatic species that exist or may exist in San Pablo Bay and associated aquatic habitats are discussed in Section 3.5, *Marine and Terrestrial Biology*. Table 4.5-2 on the following page provides an overview of the time of year salmonids, green sturgeon, and other important Bay Area fish species are present in San Pablo Bay. Direct and indirect impacts on these species and habitats resulting from construction, maintenance, operation, and decommissioning of the proposed alternatives are analyzed below. When necessary, impacts to fish and mammal species are grouped into the following categories, based on where they reside in the water column (since impacts are expected to be similar to species that reside in the water column versus the bay floor) and their level of protection:

- **Green Sturgeon** (*Acipenser medirostris*) (Federal Threatened, California Species of Concern);
- **Salmonids:** Sacramento River winter-run Chinook salmon (Federal Endangered, State Threatened) and Central Valley spring-run Chinook salmon (Federal Threatened, State Threatened, Essential Fish Habitat) (*Onchorhynchus tshawytscha*), Central California Coast Steelhead and Central Valley Steelhead (*Oncorhynchus mykiss*) (Federal Threatened, State Threatened, Essential Fish Habitat), and Central Valley fall and late fall-run Chinook salmon (California Species of Concern, Essential Fish Habitat);
- **Mid-Water Fish:** river lamprey (*Lampertara ayresii*) (California Species of Concern), longfin smelt (*Spirinchus thaleichthus*) (Federal Threatened), Delta smelt (*Hypomesus transpacificus*) (Federal Threatened, State Threatened) – rare in San Pablo Bay, Northern anchovy (*Engraulis*

mordax) (Essential Fish Habitat), Pacific Sardine (*Sardinops sagax caerulea*) (Essential Fish Habitat), and anadromous striped bass (*Morone saxatilis*) (protected under Executive Order 13449);

- **Ground Fish:** Sacramento splittail (*Pogonichthys macrolepidotus*) (California Species of Concern), Starry flounder (*Platichthys stellatus*), English sole (*Parophrys vetulus*), lingcod (*Ophiodon elongates*), sand sole (*Psettichthys melanostictus*), leopard shark (*Triakis semifasicata*), big skate (*Raja binoculata*), brown rockfish (*Scorpaenideae auricltus*), and Pacific whiting (*Merluccius productus*) (all Essential Fish Habitat-managed species managed under the Groundfish Fisheries Management Plan);

- **Marine Mammals:** Northern elephant seal (*Mirounga angustirostris*), harbor porpoise (*Phocoena phocoena*), Steller sea lion (*Eumetopius jubatus*), gray whale (*Eschrichtius robustus),* humpback whale (*Megaptera noveangliae*), harbor seals (*Phoca vitulina richardsi*), and California sea lion (*Zalophus californianus*); and

- **Benthic Organisms:** Dungeness crab (*Cancer magister*), native Baltic clam (*Macoma balthica*) – intertidal mudflats, introduced *Mya arenaria* and *Gemma gemma* – prefer fine silts and clay bottoms, *Ilyanassa obsolete*, and Asian clam *Potamocorbula amurensis*.

- **Habitats:** Eelgrass beds, benthic, deep and shallow subtidal, mudflats, intertidal, and salt marsh.

Table 4.5-2. Life Stage and Time of Year Fish Species Are Present in San Pablo Bay

Distinct Population Segment/ Evolutionary Significant Unit	Life Stage			
	Adult Migration	**Spawning/ Incubation**	**Juvenile Rearing**	**Juvenile Migration**
Central California Coast steelhead	Nov–May	NA	NA	Mar–Jun
Sacramento River winter-run Chinook salmon	Jan–Jun	NA	NA	Oct–Apr
Central Valley spring-run Chinook salmon	Mar–Aug	NA	NA	Oct–May
Central Valley fall/late fall-run Chinook salmon	Jul–Feb	NA	NA	Oct–Jun
Central Valley steelhead	Sep–Mar	NA	NA	Dec–Jun
Green sturgeon	Feb–Jul	NA	Year-round	Year-round
Longfin smelt	NA	NA	Dec–June	Dec–June

Impact MTB-1: Entrainment in Dredge Equipment during Construction Excavation, Maintenance Dredging and Operational Dredged Material Removal.

Alternative 1: No Action

Green Sturgeon, Salmonids, Mid-Water Fish, Groundfish, and Benthic Organisms

Maintenance and/or replacement of the dredged material transfer pipeline, should it occur, could result in disturbing 0.07 ac of mudflat habitat and 2.1 ac of subtidal habitat. Minor excavation may be required to replace all or parts of the pipeline; should excavation be necessary, it would occur using a clamshell dredge. Fish and benthic organisms present within the immediate construction footprint have the potential to be injured or killed by contact with the dredging apparatus. However, should dredging be necessary, it is expected to be minimal and result in injury or mortality of few organisms.

NOAA-Fisheries and the USFWS were consulted on the design of the off-loader facility with respect to impacts to salmonids and Essential Fish Habitat. Consultation resulted in a design that will not entrain smolts or adults of these species. A fish screen is required on the water intake pipeline for any off-loader facility used to deliver dredged material to the restoration projects. The screen will have a mesh size of no more than 3/32 inches and will be configured so that the approach velocity at the screen does not exceed 0.33 feet per second.

Based on this analysis, potential impacts to fish and benthic organisms resulting from maintenance and/or replacement of the off-loader facility are considered to be ***less than significant***. No mitigation is required.

Alternatives 2 and Alternative 3:

Construction of Alternative 2 – unconfined ATF (Proposed Action) and Alternative 3 – confined ATF would result in the excavation of a 34-ac ATF basin with 1-ft vertical to 4-ft horizontal side slopes in subtidal waters; resulting in a total 58 ac of disturbed habitat and an initial excavation volume of 1.6 mcy. The ATF basin would be dredged to approximately –45 to –60 feet MLLW, depending on the exact location chosen (the ATF would be approximately 30 feet deeper than the existing bay floor). If the ATF is constructed in waters too shallow for safe navigation, an access channel would be required. The access channel would be approximately 250 feet wide, 3,000 feet long, dredged to –32 feet MLLW, and result in excavation of approximately 211,000 cy of material from 17 ac of deep subtidal habitat. Additionally, the access channel would require annual maintenance dredging of approximately 120,000 cy of material. Replacement and/or maintenance of the dredged material transfer pipeline, should these activities be required, would be similar to the activities described for Alternative 1.

Excavation and maintenance dredging of the ATF basin would occur using a hydraulic cutterhead dredge. The hydraulic action of the dredge would draw a mixture of approximately 20% dredged material and 80% water creating an entrainment field in the immediate vicinity of the cutterhead. The total project area for Alternatives 2 and 3 would be approximately 77 ac (with an access channel) and 58 ac for Alternative 3 (if no access channel is necessary); however, dredged material placement would only occur in a small portion of the project footprint at any one time. Construction excavation and maintenance dredging of the ATF Basin and access channel would occur using a hydraulic cutterhead or clamshell dredge operating during the existing dredging work window (January 1 through June 30), or a work window designed for this project through consultation with regulatory agencies.

Green Sturgeon

Threatened green sturgeon juveniles, subadults, and adults are a bottom-dwelling species known to be widely dispersed in San Francisco Bay (Beamesderfer et al. 2004), including the proposed ATF locations. Adult sturgeon are present in the Bay during migration, whereas juveniles are present year-round and use the Bay for foraging and nursery habitat (Kelly et al. 2006 and USACE, unpublished data 2008). Adults enter the Bay to spawn in the Sacramento River every 4 to 11 years, between February and July, (some adults enter the Bay as early as late winter) (Beamesderfer et al. 2002, CDFG 2001, and Surface Water Resources 2002). Soon after spawning, adults leave spawning grounds for the Pacific Ocean. When juveniles reach approximately 1 to 2.5 feet long, they migrate to San Francisco Bay waters where they rear for 1 to 3 years before migrating to sea.

The Southern Distinct Population Segment (DPS) of green sturgeon is endemic to San Pablo Bay/Sacramento River, as they only spawn in the Sacramento River. The density of Southern DPS green sturgeon in San Pablo Bay appears to be very low. In fact, green sturgeon caught in trammel nets in the Bay over years sampling only ranged from 5 to 110 fish per year, further indicating their low populations (Beamesderfer et al. 2004). A green sturgeon has been caught in the "Sturgeon Triangle" (Kelley et al. 2007).

The potential for hydraulic dredge entrainment depends on many factors, including: the strength of the entrainment field generated by hydraulic dredging (the area around hydraulic dredging activities where the suction action of the dredge entrains water and some marine organisms within the field), the abundance, swimming ability (which is positively related to size), and behavioral responses of green sturgeon to dredging activities (e.g., increases suspended sediment), the total area dredged, duration of dredging, speed of dredging, and possibly other factors. Lack of information on the behavioral responses and numbers of green sturgeon in San Pablo Bay makes it difficult to estimate with certainty the number of green sturgeon that could be entrained during excavation activities.

Dredged material placed in the ATF basin from other in-Bay maintenance dredging projects could have a higher content of infaunal invertebrates than construction-related deepening material. This is because construction-related deepening material is anoxic and does not support infauna. As such, green sturgeon may forage over the placed dredged material, thus making them susceptible to entrainment during operational dredging and transfer of dredged material. Moreover, some individuals may be attracted to dredging activities; potentially for foraging. Studies are currently being conducted to better determine green sturgeon movement in the greater San Francisco Bay and other parts of the West Coast.

A study conducted to monitor the movement of white sturgeon in the Columbia River using hydroacoustic tags indicated that white sturgeon did not relocate extensively during dredging or hopper dredge disposal operations. In fact, there seemed to be an increased movement towards dredging operations by some fish, possibly due to increased prey availability from maintenance dredged material placement (Parsley and Popper 2004). However, the correlation between white sturgeon and green sturgeon movement in rivers and estuaries may not be the same.

It is expected that larval, juvenile, and adult fish species present within the entrainment field of the cutterhead dredge may not be able to escape and may be drawn into the cutterhead action of the dredge. This may be more pronounced with slower swimming, smaller juvenile sturgeon, should they enter the entrainment field, as larger sturgeon are known to be strong swimmers. During a majority of the time dredging occurs, the cutterhead operates beneath the surface of bay bottom, as opposed to suctioning on the surface of the sediments; this may alleviate the potential to entrain sturgeon. Further, it is anticipated that during excavation of the ATF, the deeper anoxic sediments would not provide an adequate food source for sturgeon; therefore, sturgeon may not be attracted to the project footprint during excavation. The level to which sturgeon could be present in the project area and whether or not they are attracted to construction, maintenance, or operational dredging activities is uncertain. Moreover, sturgeon are year-round species in San Pablo Bay and no environmental work window currently exists for them.

As previously discussed, there is limited information on green sturgeon distribution and movement in San Francisco Bay. As such, the LTMS agencies are conducting green sturgeon tagging studies to develop an understanding of the spatial and temporal distribution and movement of green sturgeon in San Francisco Bay. As part of the proposed project, USACE will consult and coordinate with NOAA Fisheries prior to construction and operation of any action alternative to install acoustic monitors in the general area of the ATF basin and for any potential effects on green sturgeon. Should the tagging studies indicate that green sturgeon are attracted to the site, USACE will develop measures in consultation with NOAA Fisheries to further reduce any potential entrainment impacts on green sturgeon.

Data gathered from green sturgeon tagging studies and consultation with NOAA Fisheries, as well as implementation of **Mitigation Measure WSQ-MM-1** (which could reduce the area of the entrainment field), may reduce entrainment impacts on green sturgeon; however, the level of protection is unknown. Potential impacts to green sturgeon resulting from entrainment in dredge equipment could remain ***significant and unavoidable***.

Salmonids

Five salmonid species are known to exist in San Pablo Bay, including: Central California Coastal steelhead (spawning adults migrate May through October); Central Valley spring-run Chinook salmon (March through July); Sacramento River winter-run Chinook salmon (December through July); Central Valley fall-run Chinook salmon; and Central Valley late fall-run Chinook salmon. Juvenile salmonids out-migrate as smolts, generally between January 1 and June 30.

Construction, maintenance, and operational dredging activities associated with Alternative 2 and 3 could entrain salmonids, should they be within the area being dredged. Dredging of the ATF basin and access channel would occur in deeper waters (approximately –20 feet MLLW). Although salmonids are known to swim in deeper waters, they are predominately a mid-water pelagic fish species. The dredge head would be placed as close to the bay floor as possible prior to turning the pumps on and off; therefore, it's unexpected that salmonids would be entrained. Further, studies have indicated that salmonids are generally not entrained in dredging activities. For example, no salmonids were entrained during hydraulic dredging salmonid entrainment study conducted in the Columbia River (Reine and Clarke 1998).

Due to a limited number of individual salmonids and other mid-water species expected to be within the entrainment field of cutterhead operations, it is expected that entrainment of salmonids would be limited to only a few individuals and would not result in population declines that would adversely impact salmonid species at the population level. Implementation of **Mitigation Measure MTB-MM-1** could reduce the potential for salmonids to be entrained in dredging equipment during construction, excavation, and operational placement of dredged material under Alternatives 2 and 3; therefore, this impact is considered to be ***less than significant***.

Mitigation Measure MTB-MM-1: Constrain Construction Dredging and Placement of Maintenance Dredging Material in the ATF Basin to LTMS Environmental Work Windows.

Construction excavation of the ATF basin and access channel would be constrained to the LTMS environmental work windows or other windows designated for this project through agency consultation. Additionally, placement of dredged material in the ATF basin would also be constrained to the existing LTMS environmental work windows, since maintenance dredging in San Francisco Bay is limited to these windows. Removal of dredged material from the ATF basin for beneficial use at the restoration sites could occur outside the LTMS environmental work windows; however, Agency consultation would be required prior to determining specific times when dredged material could be removed from the ATF basin and placed at the restoration sites. It is expected that implementation of this mitigation measure would provide additional protection to salmonids and other important fish resources.

Groundfish and Mid-Water Fish (including longfin smelt)

Groundfish species that venture within the entrainment field of hydraulic dredging could be entrained in the dredging activities during construction, maintenance and operational dredging of Alternatives 2 and 3. A fish entrainment study conducted at Port Sonoma, Sonoma, California, showed that in 51 hours of active cutterhead dredging, 51 fish were entrained, including non-native shimofuri goby, yellowfin goby, and striped bass, and one native prickly sculpin, and one native longfin smelt (NOAA-Fisheries and Port Sonoma 2007). Much like entrainment studies conducted in the Columbia River, compared to San Pablo Bay, Port Sonoma is a constricted water way that could limit movement of fish away from hydraulic dredging activities. Based on this analysis, it is anticipated that individual groundfish and mid-water fish that feed on the bottom (like longfin smelt) could be entrained occasionally in dredge equipment over the life of the project; however, entrainment is not expected to result in declines in groundfish or longfin smelt populations that would adversely affect these species. As such, potential impacts to groundfish species and longfin smelt resulting from entrainment in dredge equipment is expected to be ***less than significant***. No mitigation required.

Benthic Organisms, Communities, and Habitat

Juvenile Dungeness crab are an important diet for protected salmonid species and several Essential Fish Habitat -managed species and could be present in San Pablo Bay year-round (Dungeness crab in San Pablo Bay are predominately a single year class, entering the Bay between May 1 and June and leaving the following September [Wild and Tasto 1983]). Should these species be present during active dredging, individuals could be entrained in the cutterhead dredge.

Other non-motile benthic species would also be removed during construction of the proposed action. It is expected that benthic organisms and habitat existing within the entire footprint of initial excavation and any recolonization that occurs between maintenance dredging of the access channel and operational dredging of material placed in the basin would be entrained in the dredge. Compared to San Pablo Bay, the total footprint of subtidal and tidal disturbance with these alternatives is only 0.11% of the available habitat for benthic species. Following completion of the HWRP, the ATF basin and access channel would be restored to the surrounding elevations and benthic organisms would recolonize in the disturbed areas. As such, dredging could result in loss of individual Dungeness crab and benthic organisms; however, it is not expected to result in population changes such that future populations would not recover following decommissioning of Alternatives 2 or 3. As such, potential entrainment impacts to Dungeness crab and other benthic organisms are considered to be ***less than significant***. No mitigation is required.

Alternative 4 – Direct Channel to BMKV Basin

Alternative 4 would require excavation of a 22,300-ft long, -17 feet MLLW deep direct channel from the approximate location of the SF-10 disposal site to the BMKV basin site. It is estimated that the direct channel would involve excavating approximately 2.0 mcy of material, resulting in excavation of approximately 123 ac of subtidal/shallow bay and mudflat habitat. Once the channel is excavated, side slopes are expected to slump, resulting in a total disturbed area of 243 ac (233 ac of subtidal and shallow waters and 10 ac of mudflat habitat). Approximately 424,000 cy of material is expected to be dredged annually to maintain safe navigation in the direct channel. Dredging would likely be conducted with both clamshell and hydraulic cutterhead dredges.

The BMKV basin would be constructed in an upland environment outside of San Pablo Bay waters. Once the basin is constructed, the levee separating the basin from San Pablo Bay would be breached, allowing navigation access from the direct channel to the basin. Operational dredging of materials placed in the basin could result in entrainment of fish that swim in to the BMKV basin or benthic organisms that colonize in and on the placed material.

Green Sturgeon, Salmonids, Groundfish, Mid-Water Fish and Benthic Organisms

Green sturgeon, salmonids, and groundfish that may be present within the entrainment field of a cutterhead dredge could be entrained into the cutterhead apparatus. The potential for entrainment of green sturgeon, ground fish, and other benthic organisms may be higher than that for salmonids. Juvenile salmonids and other mid-water fish within the entrainment field may also be entrained during construction and maintenance dredging of the direct channel; however, because they are mid-water fish, the numbers are expected to be much lower. It is expected that all benthic organisms within the footprint of the direct channel would be entrained in the dredges, including Dungeness crab that cannot escape the entrainment field.

The potential for motile fish and crab to be entrained during maintenance of the direct channel may increase, due to confinement of fish in the direct channel during low tide. As the tide ebbs, mudflats would be exposed and fish may be attracted to the –17 feet MLLW direct channel as refuge or may be attracted to the deep-water channel traversing the shallows during high tide. Fish trapped in the channel are likely to be more susceptible to entrainment in the dredge during maintenance dredging.

Data gathered from green sturgeon tagging studies and consultation with NOAA Fisheries, as well as implementation of **Mitigation Measure WSQ-MM-1** may reduce entrainment impacts on green sturgeon; however, the level of protection is unknown. Due to the potential for entrainment during low tide and the potential for fish to be attracted to the deeper channel, entrainment of fish and some benthic species could remain ***significant and unavoidable***. No further mitigation is available to reduce this impact without compromising use of the direct channel.

Impact MTB-2: Entrainment and Burial of Green Sturgeon, Salmonids, Groundfish, and Mid-Water Fish Species in Descending Dredged Material Plume during Operational Dredged Material Placement

Alternative 1: No Action

Operation of Alternative 1 involves transferring dredged material directly from scows to the HWRP site. As such, potential impacts to green sturgeon, salmonids, groundfish, mid-water fish, and benthic organisms resulting from burial in dredged material are expected to be ***less than significant*** during operation of Alternative 1. Further, by redirecting dredged material from being disposed at other in-Bay sites (SF-9, SF-10, SF-11, and SF-16), dredged material disposal impacts on aquatic species would be significantly reduced at these sites.

Alternative 2: Unconfined ATF (Proposed Action)

During the anticipated 10-year operation of the unconfined ATF, approximately 1.6 mcy of material dredged from around the Bay will be placed in the ATF basin annually for beneficial use at the HWRP site. It is expected that placement of dredged material will occur during the current LTMS dredging work windows, or other times, pending agency consultation. Dredged material would be placed in the ATF using both self-propelled hopper dredges and tug/dump scow combinations.

Placement of dredged material under Alternative 2 could result in approximately 0 to 40 trips to the unconfined ATF per day, with an average of 8 to 12 scows daily. Placement of dredged material in the ATF basin is not expected to occur every day; rather, placement would depend on when dredging activities are occurring in the Bay. Additionally, dredged material placement is expected to be higher when USACE's hopper dredges, *Essayons* or *Yaquina* are working in the Bay. For example, dredged material from Richmond Inner and Outer Harbors is generally conducted by the hopper dredge *Essayons* in June through July; during this time, the *Essayons* will often dredge portions of the Pinole Shoals. During the approximate one-month dredging episode, the *Essayons* averages about 20 trips to the SF-10 and SF-11 disposal sites per day; other dredging projects that utilize a scow/tug for dredged material transport and placement at the ATF would increase this number. Fish species foraging in or migrating through the ATF during dredged material placement could be entrained and buried in the descending plume. Sessile benthic species, such as macro-invertebrates, that may recolonize on sediments placed at the ATF and some motile benthic species, such as the Dungeness crab, could also be buried in the descending plume during placement of dredged material in the ATF basin. As with all alternatives, redirecting dredged material from other in-Bay disposal sites could reduce dredged material disposal impacts on fish and other aquatic species that use areas near existing in-Bay disposal sites, thereby complying with the goals of the San Francisco Bay LTMS.

Factors that would affect the significance of aquatic organisms being entrained and buried during dredged material placement include: the likelihood of these species being in the ATF basin, whether or not individuals are attracted to the ATF for food, the number of trips to the ATF per day, whether placement of dredged material is occurring during migration of sensitive species, and whether adult or strong swimming individuals could escape the descending plume. The level of impacts on aquatic organisms is discussed below.

Green Sturgeon and Groundfish

Green sturgeon and other groundfish foraging in or migrating through the ATF have the potential to be entrained in the descending plume during operation of Alternative 2. Green sturgeon are highly adapted for foraging on benthic organisms, such as clams and shrimp. Sturgeon detect their prey with extremely sensitive barbels located on the underside of their snout; to eat, they protrude their long and flexible snout to suck up benthic organisms (Moyle, 2002). Other groundfish are bottom feeders that have adapted to foraging on benthic organisms as well. It is not known whether or not sturgeon and/or other groundfish species would be attracted to the potentially nutrient-rich dredged material placed in the ATF basin. Sturgeon are well adapted to turbid environments, having highly developed sensory organs for chemical and mechanic reception and a lack of well developed visual sensory organs (Moyle and Czech, 1983). Further, green sturgeon and several groundfish species are present in San Pablo Bay year-round and, therefore, could be present in the ATF basin during any dredged material placement activities.

Should these species be attracted to the ATF site, individuals could be entrained and buried in the descending dredged material plume. On the other hand, should the ATF basin not attract green sturgeon and other groundfish and relatively few enter the basin, entrainment and burial impacts could be negligible to individuals and populations. Average daily trips are expected to be 8 to 12 daily with rare occasions when trips exceed 20 per day (and a maximum of 40 daily trips). It is expected that larger, stronger fish would be able to escape the descending plume. Although uncertainty exists as to whether green sturgeon would be present in the ATF, the extent of the water column that would be affected by the descending plume would be rather small, compared to the ATF basin and San Pablo Bay; as such potential impacts to green sturgeon resulting from burial in descending plumes during dredged material placement is expected to be ***less than significant***. No mitigation is required.

Salmonids and Other Mid-Water Fish

As with groundfish species, salmonids and other mid-water fish within the ATF basin during dredged material placement have the potential to be entrained and buried in descending dredged material plumes. However, as discussed above, salmonids and other mid-water fish are likely to flee areas disturbed by high concentrations of suspended sediments. It is anticipated that during dredged material placement, suspended sediment concentrations in the immediate vicinity of placement activities would be high enough to elicit a fleeing response from salmonids and other mid-water fish (Bash, Berman, and Bolton 2001; Simenstad et al. 1999). With implementation of **Mitigation Measure MTB—MM-1**, constraining placement of material dredged from Bay Area maintenance dredging projects to the LTMS environmental work windows, this impact is considered ***less than significant***.

Benthic Organisms

Based on the continued disturbance of benthic habitat, which would limit recolonization, it is expected that potential effects to benthic organisms resulting from burial by dredged material is expected to be ***less than significant***. Benthic organisms that recolonize dredged material placed at the ATF would be buried by the descending material during dredged material placement of the ATF. It is expected that the extent of recolonization of benthic communities would be minimal as the basin would be continually disturbed by placement of dredged material and subsequent transfer to the HWRP site. No mitigation is required.

Alternative 3: Confined ATF

Green Sturgeon, Salmonids, Mid-Water Fish, Groundfish, and Benthic Organisms

The mechanisms for entrainment and burial of fish and benthic organisms during operational placement of dredged material in the confined ATF are similar to those discussed for Alternative 2. The difference is that under Alternative 3, confining walls would be constructed around the ATF basin to limit the amount of sediment that escapes the ATF during operation. It is expected that the confining walls would also limit marine organisms from entering the ATF basin during operation. As such, potential entrainment and burial impacts to fish and benthic organisms during operational placement of dredged are considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Green Sturgeon, Salmonids, Mid-Water Fish, Groundfish, and Benthic Organisms

The BMKV basin would be located adjacent to San Pablo Bay on the BMKV site. Following construction of the BMKV basin and direct channel, the perimeter levee adjacent to the proposed direct channel would be breached providing hydraulic connection to San Pablo Bay. Fish that swim into the basin during operational dredged material placement have the potential to be entrained and/or buried in the descending dredged material plume. In addition, benthic organisms that may recolonize on material placed in the basin could be buried in the descending material. Entrainment may occur during low tide as fish confined in the direct channel may flee from approaching vessels into the ATF basin for refuge. However, it is anticipated that the 250-foot-wide opening would limit the number of individuals that enter the basin. Due to the limited number of aquatic organisms anticipated to be in the BMKV basin during operation of Alternative 4, potential impact to aquatic organisms resulting from entrainment and burial in dredged material plumes is expected to be ***less than significant***. No mitigation is required.

Impact MTB-3: Injury or Mortality from Propeller Strikes, Vessel Collision, and/or Entrainment in Prop Wash during Construction, Maintenance, Operation, and Decommissioning.

During construction, maintenance, operation, and decommissioning of the proposed alternatives, fish species have the potential to be struck by propellers on dredges, tugs, and other construction vessels. Fish in the project area have a greater potential of being struck by propellers than marine mammals, since marine mammals are powerful swimmers, highly alert and familiar with vessels; as such, there is ***no impact*** to marine mammals by these slow moving vessels under all of the alternatives. The level of impact on fish species for each alternative is discussed below.

Alternative 1: Dredged Material Off-loader Facility (No Action)

Construction of Alternative 1 would involve transporting an off-loader facility to the approximate area of the SF-10 disposal site using a tug and potential installation and/or replacement of a dredged material transport pipeline. Operation would involve tugs transporting material dredged from around the Bay to the off-loader facility. Depending on the amount of dredged material that may be transported to the off-loader facility, tugs and scows may be required to wait to off-load material. As discussed, anywhere from 0 to 8 tug/scow combinations are expected to call upon the off-loader facility per day during the LTMS environmental work windows (either existing windows or windows developed during consultation with the regulatory agencies).

Fish, including green sturgeon and salmonids have the potential to be struck by propellers or vessels, or entrained in vessel prop wash, should they be present in the immediate area of construction, maintenance, and/or operational vessel traffic.

During construction and operation of this alternative, vessels would be operating at a slow speed (i.e., 0 to 5 knots) and operations would occur in relatively deep water (ambient depth is approximately 20 to 30 feet). Operational use of tug/scow combination would occur for approximately 18 years, thus vessel traffic and associated propeller strikes could be somewhat high over the course of the project. With implementation of protective measures described in **Mitigation Measure MTB—MM-2,** potential effects to fish are considered ***less than significant***.

Mitigation Measure MTB-MM-2: Limitations on Construction and Operation Vessel Speed.

Construction and operation vessels (dredges, tugs, and scows/tug combinations) speed will be limited to 2 knots or less when approaching or operating in the project sites. For smaller support vessels carrying personnel and/or supplies to the project area, speed limits will be limited to 5 knots or less in the project area. Limiting construction and operation vessel speeds in the project area will minimize the likelihood of propeller strikes and other vessel collisions to, as well as prop wash entrainment of fish that may be in the project area.

Alternatives 2 and Alternative 3:

Marine vessels used to construct, maintain, place dredged material, and decommission Alternatives 2 and 3 have the potential to collide with (including propeller strikes) fish that may be present in the project area. Excavating the ATF would require the use of a cutterhead dredge and a tug to maneuver it; operational placement of dredged material at the ATF would include the use of hopper dredges, as well as tug/scow combinations. Because Alternatives 2 and 3 would allow for more projects, including hopper-dredged projects, to beneficially use dredged material for restoration at the HWRP site than Alternative 1, the potential for propeller strikes and vessel collisions may increase.

However, similar to Alternative 1, Alternatives 2 and 3 would be located in deeper waters (20 – 30 feet), which may limit the number of collisions and strikes on fish, and possible prop wash entrainment. Further, with implementation of **Mitigation Measure MTB-MM-2,** potential impacts to fish are considered ***less than significant***.

Alternative 4: Direct Channel to BMKV Basin

Construction vessels and tug/scow combinations used to transport dredged material to the BMKV basin could collide, strike with their propellers, and/or entrain in prop wash fish that may be present in the direct channel footprint or BMKV basin during construction and operation of Alternative 4. During low tide, fish that become entrained in the direct channel or BMKV basin would be much more susceptible to vessel collision and propeller strikes when vessels are using the channel.

It is anticipated that recolonization of benthic communities in the direct channel would be minimal following initial excavation and annual maintenance dredging, due to continued vessel traffic during operation of Alternative 4.

Possible confinement of fish species in the direct channel and ATF during low tide could increase the number of collisions and propeller strikes. Although **Mitigation Measure MTB—MM-2** could limit the number of collisions and propeller strikes on fish species, entrainment into the shallow and narrow direct channel could still result in ***significant and unavoidable*** impacts on fish species.

Impact MTB-4: Impacts to Aquatic Organisms Resulting from Contact with Resuspended Sediment Plumes.

Increased suspended sediments in aquatic habitats can impact aquatic resources both directly and indirectly. The level of impact to individuals depends on amount of time an individual is exposed to suspended sediments, the concentration of suspended sediment in the water column and the composition of the sediments (fine-grained versus coarse-grained, chemical associations, etc.). Impacts could result in physical or behavior responses of aquatic organisms.

Physiological responses to increases suspended sediment loads include: gill trauma, increased coughing rates, osmoregulation and blood chemistry imbalances, reduced growth, changes in respiration, reduced water filtration rates, delayed or reduced hatching of eggs, interference with egg adhesion, reduced/abnormal larval growth/development, abandonment of monogamous partners, reduced response to physical stimulus – all of which can lead to mortality of individuals (Bash, Berman and Bolton, 2001; Anchor Environmental, 2003; O'Conner, 1991).

Behavioral Responses to suspended sediment include: avoidance and/or attraction, disruptions in territoriality, alarm reaction, cover abandonment, reduced reaction to prey species, reduced feeding, disruptions in the ability to school, disruptions in spawning and disruptions in homing and migration (Bash, Berman and Bolton, 2001; Anchor Environmental, 2003; O'Conner, 1991).

Particles resuspended in the water column during construction, maintenance, operation, and decommissioning the alternatives would increase turbidity, thus affecting the optical properties of salmonids, longfin smelt and other visual feeders. Turbid conditions can alter the reaction distance of juvenile salmonids to planktonic prey as a log-linear function of increasing turbidity (Gregory and Northcote 1993). Shading structures, such as the off-loader facility (Alternative 1) and the confining walls (Alternative 3) could also reduce visibility of optical feeders. Green Sturgeon, on the other hand, are benthic feeders with a sophisticated sensory system composed of extraoral gustatory organs (Gessner, Van Eenennaam and Doroshov 2006).

All alternatives would involve redirecting dredged material from disposal at other in-Bay sites (SF-9, SF-10, SF-11, and SF-16) for beneficial use at the HWRP site. Reducing in-Bay disposal at other sites would reduce the impacts on aquatic organisms resulting from contact with resuspended sediments near these disposal sites. Under Alternative 2, however, the reduction of impacts at other in-Bay disposal sites would be concentrated at the ATF basin. The SF-10 disposal site, which is adjacent to the proposed unconfined ATF, is authorized to receive 500,000 cy of dredged material disposal per year and all sediment disposed of at this site redisperses in San Pablo Bay. Further, during most years, all of dredged material disposed of at the SF-10 site would be redirected to the ATF basin, it is expected that species present in the general vicinity of the proposed unconfined ATF (and SF-10) would not experience impacts significantly above baseline conditions.

Alternative 1: No Action

Green Sturgeon, Salmonids, Mid-Water Fish (including Longfin smelt), Groundfish, and Dungeness Crab

Maintenance and/or replacement of the dredged material transfer pipeline and piles for the booster pump and off-loader facility platform would increase suspended solids surrounding the construction area. Fish species and benthic species present during construction have the potential to be directly affected by increased suspended sediment plumes generated during construction (physiological and behavior responses to fish species are discussed above).

Operation of Alternative 1 would result in a reduction of approximately 1.2 mcy of dredged material placement at in-bay sites. While there would be a reduction of elevated suspended sediment concentrations related to dredge material placement, overall suspended sediment concentrations in San Pablo Bay are anticipated to remain at ambient levels. Spills of dredged material may occur during transport and off-loading; however, spills are anticipated to be rare. Construction, maintenance, operation and decommissioning Alternative 1 are expected to result in temporary and localized increases in suspended sediment. As such, impacts to fish, benthic organisms, and marine mammals from contact with increased suspended sediment are considered to be ***less than significant***. No mitigation is required.

Alternative 2: Unconfined ATF (Proposed Action)

Construction, maintenance, operation and, to a lesser extent, decommissioning Alternative 2 would resuspend bottom sediments near construction excavation and dredged material placement and subsequent removal. Suspended sediment concentrations would be highest in the vicinity immediately surrounding construction and dredged material placement. Larger sediments would settle out of suspension more quickly while most of the finer sediments would be carried with the currents and settle in other parts of San Pablo Bay. Following construction activities, increased suspended solids are expected to dissipate to background levels.

Operational placement of dredged material could occur on any day during dredged material placement window and could result in approximately 0 to 40 trips per day (with an average of 8 to 12 trips per day). During placement, approximately 4% materials could be stripped from the descending plume causing turbidity in the surrounding water. As discussed in Section 4.4-4, *Potential Impacts to Water and Sediment Quality*, STFATE modeling conducted for this project suggests that suspended sediment plumes would dilute in the surrounding water column as they are carried with the currents approximately 2.5 mi from active dredging (MacWilliams and Cheng 2007).

Other factors that determine the suspended sediment plume extent, concentration, and duration in the water column include sediment physical characteristics (e.g., type, grain size, and shape), tides, and currents of San Pablo Bay. Generally, fine-grained sediments stay in the water column longer than sandy sediment and, therefore, result in increased suspended sediment concentrations that remain in the water column for longer periods. Section 4.4-4, *Potential Impacts to Water and Sediment Quality*, provides a discussion of suspended sediment plumes generated from dredged material placement in the ATF.

Fish and benthic species that come in contact with resuspended particles have the potential to suffer injury or reduced survival. The level of injury to individuals would depend on their proximity to construction activities, the type of material being excavated during construction and maintenance of the ATF and the type of material being placed in the ATF during operation. This impact would be limited to aquatic organisms that utilize habitat at and in the immediate vicinity of the ATF site.

Green Sturgeon, Salmonids, Mid-Water Fish (including Longfin smelt), and Groundfish

Fish present during construction could experience physical and behavioral impacts (described above) resulting from contact with suspended sediment particles. Exposure to increased concentrations of suspended sediments during construction is expected to be temporary, not lasting more than 2 to 3 months and only during the times when the bottom substrate is being disturbed. Periodic operation-generated suspended sediments impacts would occur for the entire duration of operation (approximately 10 years).

Limiting construction and operational placement of dredged material under Alternative 2 to the LTMS environmental work windows could reduce impacts to salmonids, longfin smelt, and other fish in San Pablo Bay; sturgeon, on the other hand, are a resident species in San Pablo Bay and are known to exist in the project area. Construction and operational placement of dredged material would be confined to a small area, compared to the open waters of San Pablo Bay, it is expected that sturgeon and other fish species would relocate to other areas if suspended sediment reached concentrations that would elicit adverse physical or behavior responses. As such, potential impacts to fish resulting from contact with construction, maintenance, operational, and decommissioning of Alternative 2 are expected to be ***less than significant***. Further, implementation of **Mitigation Measure MTB—MM-1** (constrain construction dredging operations and placement of maintenance dredging material in the ATF basin to LTMS environmental work windows) would further limit impacts to salmonids and other organisms with environmental work windows.

Benthic Organisms and Dungeness Crab

Suspended sediment plumes generated during construction, maintenance, operation, and decommissioning the ATF could settle onto benthic organisms, which could clog gills and reduce filtration by filter feeders. Benthic organisms in the general vicinity of the unconfined ATF are expected to be tolerant of some disturbance, due to their proximity to the Pinole Shoals shipping channel and SF-10 disposal site. Further, benthic organism recolonization in the ATF and access channel is expected to be minimal, since the footprint would be continuously disturbed. Further, once the restoration projects are complete, the ATF footprint would be returned to pre-construction conditions and the quality of benthic communities could reestablish. As such, this impact is considered to be ***less than significant***. No mitigation is required.

Alternative 3: Confined ATF

Green Sturgeon, Salmonids, Mid-Water Fish, Groundfish, and Benthic Organisms

Other than suspended sediment plumes generated by pile driving for confining wall, suspended sediment generated during construction of Alternative 3 is expected to be similar to the Alternative 2, discussed above. Operation of Alternative 3, however, would prevent a majority of suspended sediment generated during placement of dredged material from escaping the confining walls. If individuals swim into the confined ATF during dredged material placement, they could experience a greater level of impacts, since suspended sediment plumes would be retained within the wall for longer periods

It is expected that few fish species would swim into the confinement and the confining walls are expected to keep a majority of the suspended sediment plume out of San Pablo Bay. Further, benthic habitat recolonization inside the confining walls is expected to be minimal. As such, this impact is considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Green Sturgeon, Salmonids, Mid-Water Fish, Groundfish, and Dungeness Crab

Dredging a direct channel through shallow subtidal and mudflat habitat would resuspend sediments during construction and maintenance. Operational use of the channel by tug/scow combinations may resuspend sediments along the bottom of the channel and placement of dredged material in the BMKV basin would create suspended sediment plumes, some of which would escape to San Pablo Bay.

Fish using the direct channel or within the basin could be subject to resuspended sediments generated from vessel traffic or dredged material placement, respectively. During low tide, fish entrained in the direct channel would be more susceptible to this impact. Implementation of **Mitigation Measure MTB—MM-1** would reduce this impact to juvenile salmonids and other species with LTMS environmental windows; however, there are no environmental windows for green sturgeon, Dungeness crab, and other aquatic species. Because individuals entrained in the direct channel could be adversely impacted when suspended sediment concentrations are elevated in the channel, this impact could remain ***significant and unavoidable***.

Benthic Organisms

Construction, maintenance, operation, and decommissioning of Alternative 4 are expected to limit recolonization of benthic species in the footprint of the ATF basin and direct channel. During maintenance dredging and operational vessel use of the direct channel, resuspended sediments would be released into the water column and could settle on benthic habitat located adjacent to the channel. Maintenance dredging would be annual, thus resulting in limited temporary impacts as well. Operation would occur on a more constant basis, which could result in increased suspended sediment settling on benthic habitat; however, it is expected that a majority of sediments resuspended while vessels traverse the channel would stay within the confines of the channel, thus reducing this impact on benthic organisms in San Pablo Bay. As such, this impact is considered to be ***less than significant***. No mitigation is required.

Impact MTB-5: Impact to Aquatic Organisms Resulting from Contact with and Bioaccumulation of Constituents of Concern Released during Construction, Maintenance, Operation, and Decommissioning

Disturbance of sediments during construction, maintenance, operation, and decommissioning the alternatives could result in releases of constituents of concern (including trace metals and organic compounds) that can become available for uptake by aquatic organisms. Uptake of trace metals and/or organic compounds can lead to direct mortality, reduced fitness, reduced fecundity of organisms, and bioaccumulation (Anchor Environmental 2003).

Trace metals associated with suspended sediment particles generally become available to biological receptors when they are released in the dissolved state. Organic compounds, on the other hand, are often less soluble; however, organic compounds are often attached to the surface of finer-grained sediments, which can also make them bioavailable when ingested by organisms.

Biological effects of suspended sediments and attached metals and organics are divided into chronic effects (the stressor persists for longer than 96 hours) or acute effects (the stressor persists for less than 96 hours), and lethal (the organism dies) and sublethal (the organism experiences some level of reduced fitness but does not die). Often, acute and chronic effects of suspended sediment and elements and compounds associated with suspended particles overlap. Further, some organisms may not experience lethal effects resulting from contact with suspended particles, however; they may not fully recover from sublethal effects. The effect to aquatic organisms depends on the concentration and bioavailability of substance, the duration the substance persists in a bioavailable form, and the sensitivity of the organism to the substance (Anchor Environmental 2003).

Bioaccumulation of organic contaminants occurs as biological receptors ingest the compounds and partition them into the carbon structure – generally in the fat cells. Bioaccumulation begins with compound ingestion of organic compounds or sediments containing organic compounds, such as by filter feeders (Anchor Environmental 2003). As organisms ingest prey containing certain organic contaminants, they can be concentrated up the food chain, until they are ingested by humans.

Of particular concern in San Francisco Bay is bioaccumulation of methylmercury, in addition to other constituents of concern. As discussed in Section 4.4-4, *Potential Impacts to Water and Sediment Quality*, results of sedimentation modeling in San Pablo Bay suggests a HMD layer exists within the proposed footprints of the alternatives. Mercury concentrations of the HMD layer are expected to range between 0.3 to 0.6 µg/g (Jaffe and Fregoso 2007). Exposing this anoxic layer to oxidized conditions of the surrounding water column could result in temporary spikes in reactive mercury concentrations near the floor of active dredging. Depending on site-specific conditions (availability of sulfate-reducing bacteria, electron donors, organic carbon, pH, and salinity), the reactive mercury could be transformed to bioavailable methylmercury (Marvin-DiPasquali, 2008). The formation of methylmercury requires that all of the above listed site-specific conditions be available for mercury to be converted into methylmercury.

Alternative 1: No Action

Green Sturgeon, Salmonids, Mid-Water Fish, Groundfish, and Benthic Organisms

Maintenance and replacement of the structures associated with Alternative 1 may result in minor disturbance of shallow intertidal and mudflat sediments. Fine sediments are known to bind readily with metals and organic compounds; however, it is not known if HMD layer exists in the surface sediments that would be disturbed. Disturbance of these sediments would be minor in scale and temporary, persisting only during maintenance and/or replacement of the dredged material transfer pipeline and off-loader facility platform.

Operation of the off-loader facility would not involve placement of dredged material in San Pablo Bay; therefore, metals and organic compounds would not be released to the water column, except in rare instances of spills.

Maintenance, replacement, operation, and decommissioning of the off-loader facility are expected to result in minimal release of metals and organic compounds into San Pablo Bay waters. It is expected that any ingestion of trace metals and other constituents of concern would also be minimal, as would the risk of bioaccumulation. As such, this impact is considered ***less than significant***. No mitigation is required.

Alternatives 2 and Alternative 3

Green Sturgeon, Salmonids, Mid-Water Fish, Groundfish, and Benthic Organisms

Construction of the ATF basin and access channel (should the basin be in waters requiring an access channel) is expected to take approximately 3 to 4 months and would occur in areas that may be underlain by HMD. USGS (2007) modeling results indicate that construction of Alternatives 2 and 3 could result in excavation of approximately 4,000 cy to 1.4 mcy of sediment containing HMD, depending on the exact location chosen. As discussed, excavation of this layer could result in temporary spikes in the availability of reactive mercury that can be methylated by sulfate-reducing bacteria. Further, other compounds that could contaminate and/or bioaccumulate could be present in the sediments that underlie the specific ATF basin site.

Operation of Alternatives 2 and 3 would result in placement of approximately 1.6 mcy of dredged material in the ATF basin annually for subsequent beneficial use at the HWRP site (up to 3.6 mcy in a maximum year). Sediment placed in the ATF basin must comply with the requirements of the RWQCB and USFWS's respective permits, which limit the concentrations of several potential contaminants (Table 2-4 in Chapter 2, *Description of Alternatives,* provides these requirements). Due to these restrictions, is expected that material placed in the ATF basin would be required to meet these standards and, therefore, would not pose a threat to aquatic resources during operation of Alternatives 2 or 3.

Fish and benthic organisms exposed to increased concentrations of metals and organic substances may experience lethal or sublethal impacts. These impacts may be more pronounced for benthic filter feeders that exist in areas adjacent to the ATF basin during construction activities. Although a very small percent of contaminants associated with excavation of the ATF may become bioavailable during construction of Alternative 2 or 3, it is expected that implementation of **Mitigation Measure MTB-1**, confining the initial construction excavation and operational placement of dredged material to the LTMS environmental work windows would limit the potential for this impact to aquatic fish species. Further, implementation of **Mitigation Measure WQ—MM-3**, preparation and approval of a sediment testing plan and subsequent compliance during construction of Alternative 2 and 3, could reduce the potential for exposure of all aquatic organisms constituents of concern, and the risk of subsequent bioaccumulation. Therefore, this impact is considered ***less than significant***.

Alternative 4 – Direct Channel to BMKV Basin

Green Sturgeon, Salmonids, Mid-Water Fish, Groundfish, and Benthic Organisms

Modeling conducted for this project indicated that HMD does underlie portions of San Pablo Bay (Jaffe and Fregoso 2007); however, the modeling was not detailed for this Alternative. Construction of the direct channel would disturb approximately 119 to 233 ac of intertidal habitat and 4 to 10 ac of mudflat habitat, depending on side slope slumping. It is not known whether HMD exists or not in the sediments that would be excavated from the direct channel. However, much of the material that would be excavated contains fine-grained sediments, which is known to bind more readily with metals and organic compounds. It is expected that excavation of fine materials during construction of the direct channel could result in release of constituents of concern and species present during excavation could become exposed to these substances.

Dredged material placed in the BMKV basin during operation are required to meet the same suitability requirements for beneficial use at HWRP as described for Alternatives 2 and 3; as such, operational placement of dredged material is not expected to expose aquatic organisms to metals or organic compounds.

As with Alternatives 2 and 3; should this alternative be selected, a comprehensive sediment sampling plan would be developed and implemented to test sediments to determine the exact alignment of the direct channel and identify potentially contaminated sediments. Further, the sampling testing plan would designate BMPs that would be implemented during removal and disposal of contaminated sediments, as described in **Mitigation Measure WQ-MM-3**. Implementation of this mitigation measure could reduce the risk of exposure to aquatic organisms. Therefore, this impact is considered to ***less than significant***.

Impact MTB-6: Impacts to Aquatic Organisms Resulting from Pile-Driving Generated Noise

Alternative 1: No Action

Should the existing platforms for the authorized off-loader facility and booster pump not be retained or be replaced, pile driving would be required. Booster pump platforms require 4 piles (each 24 to 36 inches in diameter); construction could be accomplished in less than 2 weeks over a 6-month period. The off-loader facility platform requires approximately 24 piles (each up to 36 inches in diameter) and a platform that would be secured to a perimeter three-pile dolphin system; construction could be accomplished in less than 4 weeks during the 6-month construction period (June 1 to November 30).

Green Sturgeon, Salmonids, Mid-Water Fish, and Groundfish

Because pile-driving studies have not been completed for equipment of the size proposed for this project, this analysis is based on the results of the pile installation demonstration project (PIDP) for the San Francisco–Oakland Bay Bridge East Span Seismic Safety Project (East Span Project) (California Department of Transportation [Caltrans] 2001a, 2001b). Caltrans evaluated impacts on marine mammals and special-status fish species resulting from large pile-driving impact hammers (rated 500 to 1,700 kilojoules [kJ]) (Caltrans 2001a, 2001b). The hammers studied in the PIDP were far larger than the equipment that would be used for this project (estimated to be rated 110 to 220 kJ).

Hammers delivering up to 200 kJ are commonly used for marine and near-shore construction around the Bay.

Pile driving could take place at any time during a 6-month work window. Due to the frequency and timing of the pile driving, most juvenile special-status fish species would not be in the project area (Table 4.5-2). However, some adult salmonids, sturgeon, and other fish species could be in the project area and could be impacted by pile driving activities.

The PIDP that was conducted for the East Span Project (Caltrans 2001a, 2001b) documented fish mortality due to contraction and expansion of the swim bladder in an immediate mortality zone approximately 30 to 40 feet (10 to 12 m) from the pile-driving activity. A delayed mortality zone, wherein injury was identified to the inner ear or other fish organs that may result in mortality several hours to several days after injury, was estimated to be located in a radius of at least 500 feet (150 m) and possibly as large as 3,300 feet (1,000 m) (Caltrans 2001b). However, the Caltrans PIDP project was conducted in the South Bay with an impact hammer and not a vibratory hammer. Due to the impacts on aquatic organisms resulting from use of an impact hammer, impact hammer pile driving is limited to projects only using one hammer and less than 50 piles per day in San Francisco Bay. Any number of piles can be driven in the Bay with the use of a vibration hammer.

For common species of fish, individual mortality of fish is considered a less than significant impact. Regarding listed fish species, the proposed action would provide rearing and refuge habitat in the subtidal channels that would be created within the tidal marsh restoration areas. There remains a potential for pile-driving to harass individual fish and a potential for individual mortality of listed species. With implementation of **Mitigation Measure MTB—MM-3** this impact would be considered to ***less than significant***.

Marine Mammals

Harbor seals use Sisters Rocks (approximately 2,100 yards south of the project location) and Castro Rocks, adjacent to the Richmond–San Rafael Bridge, (approximately 7,000 yards southeast) as haul-out sites for resting and breeding. Castro Rocks is the largest haul-out site in the North Bay and the second largest breeding site in San Francisco Bay. Harbor seals also use Lower Tubbs Island as a haul-out site (approximately 11,000 yards northeast).

The PIDP for the East Span Project did not identify any apparent effect of pile driving on the Yerba Buena harbor seal haul-out site, which was located approximately 1 mi from the pile-driving activity. Because the nearest haul-out sites are both located more than 1 mi from the approximate location of the off-loader facility or ATF and booster-pump platforms, and the PIDP studied far more powerful pile-driving hammers, pile-driving activity at the platforms is not expected to affect the identified haul-out sites. Pile-driving activity may disturb harbor seals or other marine mammals swimming in the immediate vicinity of the activity. NOAA-Fisheries considers in-air noise levels below 85 decibels (dB) safe for marine mammals, but the pile-driving activity is likely to result in in-air noise levels in excess of 85 dB. NOAA-Fisheries has determined that elevated underwater sound pressure levels (SPLs) of 180 to 190 dB or higher could cause temporary hearing impairment or threshold shifts in marine mammals, thus disrupting their behavior. In the PIDP for the East Span Project, the 190-dB contour for hammer energy level of 750 kJ was calculated as about 600 feet (185 m). While not specifically studied, it is reasonable to assume that the 190-dB contour for the pile-driving equipment likely to be used for the HWRP would be far less than 600 feet. Marine mammals in the water in the immediate vicinity of the piles for the proposed expansion would be temporarily displaced if they choose to avoid the area in response to high sound pressure levels.

While the specific sound pressure levels of the equipment proposed for pile-driving activity for this project have not been studied, it is assumed that the SPLs may reach or exceed the 190 dB contour, at least in the immediate vicinity of pile-driving activity. This impact could be considered potentially significant; however, with implementation of **Mitigation Measure MTB—MM-3,** this impact is considered ***less than significant.***

Mitigation Measure MTB-3: Coordinate with Appropriate Federal and State Agencies to Reduce Impact on Marine Mammals and Special-Status Fish Species during Pile-Driving Activities.

Conservancy, USACE, or successors in interest will consult with NMFS and CDFG to implement measures to reduce impacts associated with pile-driving activities to marine mammals, special-status fish, and sea dwelling bird species. These measures could include but are not limited to the following:

- Scheduling pile-driving activities to occur outside the peak juvenile outmigration periods for special-status fish species whenever possible. June 1 to November 30 (the dredging window in San Pablo Bay) would avoid high migratory periods.
- Using pile drivers that generate the least amount of noise, such as vibratory hammers, whenever feasible.
- Monitoring marine mammals during pile-driving activity, ceasing pile-driving activity temporarily if marine mammals approach within roughly 300 feet (100 m).
- Acoustic monitoring and use of best management practices to attenuate sound, such as bubble curtains.

As a performance standard, the selected measures shall represent the best available technology that is economically achievable, and shall achieve maximum feasible reduction in underwater SPLs and/or related impacts on marine mammals and special-status fish species.

Alternative 2: Unconfined ATF (Proposed Action)

For Alternative 2, pile driving would be required for the booster pump facilities only. Booster platforms require approximately 4 piles (each 24 to 36 inches in diameter); construction could be accomplished in less than 2 weeks during the 6-month work window. The potential impacts on fish, marine mammals, and sea dwelling birds would be similar to that described above; however, since only 4 piles would be needed, rather than 24, the duration of impacts would be significantly shorter. This impact could be considered potentially significant; however, it is expected that with implementation of **Mitigation Measure MTB—MM-3,** this impact is considered to be ***less than significant.***

Alternative 3: Confined ATF

Pile driving would be required for the booster pump and ATF confinement walls. Booster platforms require approximately 4 piles (each 24 to 36 inches in diameter); construction could be accomplished in less than 2 weeks over the 6-month work window. Sheet piles, batter piles and/or H piles would need to be installed possibly every 20 feet along the sheet wall; construction of the sheet pile enclosure and basin dredging could be accomplished in 6 months following installation of the piles. The potential impacts on fish and marine mammals would be similar to that described above, however, the noise generated from driving the smaller batter and H piles, and sheet pile would be lower than for driving the 24 to 36-inch piles. This would result in a relatively smaller area around the area of the confinement walls where there would be potential for affects to fish, marine mammals, and sea dwelling birds. Implementation of **Mitigation Measure MTB—MM-3** would reduce these impacts. However, even with mitigation, there is the potential for direct harm or harassment to fish, marine mammals, and birds adjacent to pile-driving activity. Therefore, this impact is considered ***significant and unavoidable*** if pile driving is used.

Alternative 4: Direct Channel to BMKV Basin

No pile driving would be required for Alternative 4, so there is ***No Impact*** on fish, marine mammals, and sea dwelling birds.

Impact MTB-7: Loss or Disturbance of Subtidal, Intertidal, Mudflat, and Marsh Habitats and Associated Foraging, Spawning, Rearing, and Migration Habitats

Excavation and other construction activities associated with the proposed action would result in loss of subtidal, intertidal, mudflat, and marsh habitat in the project area through direct removal of habitat during excavation and indirect loss resulting from resuspension of sediments. Loss of these habitat types can affect aquatic organisms by altering feeding, nursery, and for some species, spawning habitat. It is expected that once constructed, the existing habitat would be altered from its original condition and the altered condition would be maintained throughout the life of the project. Under all alternatives, following restoration of the HWRP site, existing marsh, mudflat, intertidal, and subtidal habitat would be stabilized and improved and additional salt marsh, mudflat, intertidal, and subtidal habitat would be created.

Resuspended sediment and shading could affect the quantity and quality of foraging, spawning and migrating, and nursery habitat for aquatic species that spawn in San Pablo Bay. As discussed under Impact MTB-4, suspended sediment could alter feeding rates of visual feeders, such as salmonids. Suspended sediments could also alter spawning grounds of groundfish, mid-water fish, and benthic organisms that spawn in San Pablo Bay; spawning grounds of anadromous salmonid and green sturgeon that spawn in freshwater rivers and are not expected to be impacted by any of the alternatives. However, migration corridors of anadromous fish could be impacted by construction activities and resuspended sediments associated with construction, maintenance, operation, and decommissioning of the alternatives.

Nursery habitat and success in San Pablo Bay could also be impacted by construction, maintenance, operation, and decommissioning of the alternatives. Eggs and larvae would be the most sensitive life stages of many aquatic organisms, and successful recruitment may be more influenced by the success of these life stages, compared to adults (Conner, Hunt, and Werme [nd]). However, under natural conditions, eggs and larvae of many aquatic species naturally have a very low survival rate (ERDC 2005). Potential effects to eggs and larvae of aquatic species include: reduced hatching, smothering of eggs, and reduced larval feeding (Conner, Hunt, and Werme [nd]; Ault and Schuble 1978).

Potential direct and indirect disturbance to these aquatic habitats during construction and operation of the alternatives is discussed below.

Alternative 1: No Action

As discussed, construction of the Alternative 1 would result in the disturbance of less than 0.1 ac of mudflat habitat and 2.1 ac of subtidal habitat for maintenance and/or replacement of the dredged material transfer pipeline and off-loader facility could resuspend sediments in the project vicinity. The off-loader facility platform would also result in shading of approximately 2.2 ac of deep subtidal habitat for the 18-year life of the project.

Resuspension of sediments and shading has the potential to interfere with foraging, spawning and rearing success, and migration of aquatic species. However, maintenance of the dredged material transfer pipeline and off-loader facility platform would result in minimal resuspension of sediments. Additionally, shading by the 2.2-ac off-loader facility footprint would be minimal, compared to San Pablo Bay's 66,000 ac of surface water. As such, this impact is considered to be ***less than significant***. No mitigation is required.

Alternatives 2 and Alternative 3

Alternative 2 would result in disturbance to approximately 58 ac of deep subtidal habitat for excavation of the ATF basin, 17 ac of subtidal habitat for construction of the access channel (should the ATF be located in waters too shallow for safe navigation), and 2.1 ac of shallow intertidal and 0.07 ac of mudflat habitat for installation of the dredged material transfer pipeline – for a direct total of approximately 77 ac of aquatic habitat. Alternative 3 would disturb the same area (if an access channel is necessary) or 58 ac of habitat (if no access channel is necessary).

The habitat types would not be changed following construction; subtidal regions would be deepened by up to 30 feet and shallow intertidal and mudflat areas would be temporarily disturbed. The total project footprint represents only a very small percent (0.12%) of San Pablo Bay's aquatic habitat. The habitat loss during construction and operation of these alternatives would regenerate following restoration of the HWRP site and decommissioning.

Excavation of the ATF basin would reduce the quantity and quality foraging habitat and could entrain prey in the immediate footprint of the ATF basin and access channel, both of which could reduce foraging success of individuals.

Excavation could entrain eggs and larvae of aquatic organisms that spawn near dredging activities. In addition, resuspended sediments generated during operational and decommissioning placement of dredged material could reduce the ability of eggs to adhere to objects or to obtain sufficient oxygen levels for respiration, both of which could reduce spawning success. In addition, resuspended sediments generated during operational and decommissioning placement (Alternatives 2 and 3), as well as construction of the confining walls (Alternative 3 only) could reduce the quantity and quality of migratory corridors.

The above mentioned impacts would persist for the approximate 10-year duration of the project; however, following restoration of the sites, intertidal, mudflat, and marsh habitats, as well as associated foraging, spawning, rearing, and migration habitats would be created and existing habitat adjacent to the sites would be improved. It is expected that aquatic organisms not attracted to increased suspended sediment concentrations would forage and migrate in habitats free from impacts by construction, maintenance, operation, and decommissioning activities. Further, the area of impact is considered small, compared to the 66,000 ac of San Pablo Bay's aquatic habitat. As such, this impact is considered to remain ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Construction of Alternative 4 would result in disturbance to approximately 243 ac (disturbance to 233 ac of subtidal and shallow waters and direct loss of 10 ac of mudflat habitat) that would be maintained for the 18-year life of the project (this represents 0.37% of San Pablo Bay's aquatic habitat). During operation and maintenance of the direct channel, fish species confined in the channel during low tide could experience reduced foraging, spawning, and/or migration success. It is expected that individuals trapped in the direct channel would be able to continue these biological functions once the flood tide returns, or they could experience overall reduced fitness and/or mortality. Although implementation of **Mitigation Measure MTB—MM-1** (constrain construction dredging operations and placement of maintenance dredging material in the ATF Basin to LTMS environmental work windows), could reduce the significance of this impact for some species (green sturgeon and other year-round species do not have environmental work windows designated), the behavioral responses of individuals is rather speculative and, as such, this impact could be ***significant and unavoidable***.

Impact MTB-8: Increased Predation on Aquatic Organisms

All Alternatives

Disruption of fish, especially juveniles, in suspended sediment plumes and prop wash from project-related vessels has the potential to make them susceptible to predation. Structures that shade also provide habitat for fish that prey on smaller fish. Confining construction and operation to the environmental work windows would protect juvenile salmonid and other important fish species in the project area. Although there are no environmental windows for green sturgeon, they have no known predators in San Francisco Bay. Because the footprint of the alternatives is relatively small, compared to the area of San Pablo Bay, increased predation of fish resulting from construction, maintenance, operation, and decommissioning any of the alternatives is considered ***less than significant***. No mitigation is required.

Impact MTB-9: Impacts to Food Web

Construction and operation of all four alternatives could modify shallow bay habitats areas and remove bottom substrates, including the benthic organisms found in those substrates, which may produce food for green sturgeon and other benthic feeding fish species.

Alternative 1: No Action

Maintenance and/or replacement of the off-loader facility and dredged material transfer pipeline could result in disturbance of approximately 2.13 ac of subtidal and 0.07 ac of tidal habitat. In addition, the off-loader facility could result in shading of approximately 2.2 ac of subtidal habitat for the life of the project (18 years). Shading could reduce photosynthesis by phytoplankton and zooplankton in the shaded area. Once the restoration projects are complete, the impacted area would be returned to pre-construction conditions and the overall acreage of important bay margin habitat would be increased. Given the limited extent of habitat alteration, compared to the extent of the larger San Pablo Bay, this impact is considered to be ***less than significant***. No mitigation is required.

Alternatives 2 and Alternative 3

Excavation of the ATF basin and access channel (should the channel be required) may negatively impact food availability and production for benthic feeders, such as green sturgeon, groundfish, and Dungeness crab. Excavation would modify shallow bay habitats areas and remove bottom substrates, including the benthic organisms found in those substrates.

The operation of the ATF under Alternatives 2 and 3 would include placement of dredged material and periodic removal and transport of dredged material from the 58-ac basin to the restoration sites.

Maintenance dredging of the basin and access channel would also disturb bottom sediments and associated benthic communities. The placement of dredged material in the ATF basin and continued use of the access channel would continue to alter benthic community structure through the life of the project, possibly preventing stabilization of new benthic communities. Operational dredged material placement would also generate suspended sediment plumes that could increase turbidity and reduce photosynthesis by plankton and other primary producers in the vicinity of the ATF.

The total habitat that would be disturbed over the 10-year life of the project may reach approximately 77 ac. Once the project is complete, however, the disturbed habitat would be restored to existing conditions. Additionally, the HWRP would increase the overall acreage of subtidal habitats along the bay margin by approximately 116 ac. The temporary reduction in benthic and pelagic primary producers over the life of the project is not expected to reduce productivity within San Pablo Bay in such a way to alter the food web. As such, this impact is considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

As discussed, construction of Alternative 4 could result in a total loss of 123 to 243 ac of benthic habitat for construction of the direct channel, depending on side slope slumping. Benthic habitat that recolonizes in the direct channel is expected to be continually disturbed during operation by scow/tugs transporting dredged material to the BMKV basin for the life of the project (18 years), due to annual maintenance dredging and continued use of the channel. Further, resuspended sediments would be trapped in the direct channel during low tide, which could reduce photosynthesis by phytoplankton and other pelagic primary producers.

Although this alternative would result in increased loss of benthic habitat and potential decrease in photosynthesizing by primary producers, it is not anticipated that this loss would lead to significant changes in the food web that could impact species higher up the food chain. Additionally, the HWRP would increase the overall acreage of subtidal habitats along the bay margin by approximately 116 ac. As such, this impact is expected to be ***less than significant***. No mitigation is required.

Impact MTB-10: Loss of Eelgrass Habitat

All Alternatives

The closest eelgrass habitat is located approximately 1.4 mi southeast of the project footprint for all alternatives. As such, construction of the facilities under all alternatives is not expected to result in direct loss of eelgrass.

Indirect impacts resulting from sedimentation could increase turbidity, thus reducing photosynthesis and increased velocity could uproot eelgrass. Modeling conducted for this project indicates that minor increases in velocity (1 and 5 cm/sec or 0.02 to 0.1 knot) could occur between San Pablo Point and Pinole under Alternatives 2 and 3 during a peak flood event (MacWilliams and Cheng 2007, see Appendix A); however, this is considered minimal. Modeling conducted for Alternative 1 showed no changes in current velocities in eelgrass beds. Modeling was not conducted for Alternative 4; however, due to the distance from existing eelgrass beds, it is expected that changes in current velocities and sedimentation would be minimal.

Suspended sediment plumes generated during construction and operation of all alternatives, are not expected to reach the eelgrass beds. Suspended sediment plume tracer modeling conducted for this project conservatively indicates that during ebb tide, suspended sediment plumes would travel in a south-southwest direction, towards San Pablo Strait, dissipating before reaching the Strait, and travel north-northeast, away from eelgrass beds, during flood tide. Due to the distance and direction of the project footprint for all alternatives to known eelgrass beds, this impact is considered ***less than significant*** for all alternatives. No mitigation is required.

Impact MTB-11: Indirect Impacts to Aquatic Organisms from Accidental Petroleum Spills or Dredged Material Transfer Pipeline Leak

The effect on aquatic species from water-borne contaminants and increased suspended sediment concentrations depends on the species' sensitivity to specific types and combinations of these substances, including: concentration, duration, and frequency of exposure; water temperature conditions; and other factors. Contaminants and resuspended sediments may cause physical harm to individuals and/or reduce growth, reproduction, movement, and survival of individuals. Long-term or acute exposure over a substantial proportion of a species' habitat may reduce abundance, distribution, and production in the population and could affect the diversity of aquatic communities.

All Alternatives

Potential leaking of the dredged material transfer pipeline to a degree that could injure or harm fish species is not anticipated; however, should leaking occur, the dredged material transfer pumps would be turned off to reduce pressure in the pipeline and the pipeline would be repaired. Further, bi-weekly inspections of the pipeline would ensure that the pipeline is structurally sound and not prone to leaking. Worn pipe sections will be replaced as they are discovered, before the risk of leakage is significant.

As described in Chapter2, *Description of Alternatives*, as part of the project, an Environmental Protection Plan would be developed that would include environmental commitments to address potential spill or exposure issues that may occur during construction. This would include spill control, contaminant prevention, wastewater management, and other foreseeable hazards. Implementation of these measures is anticipated to minimize effects on the local fish, marine mammal, and seabird populations to less than significant levels. As such, potential impacts to fish, benthic organisms, and marine mammals resulting from pipeline leakage and/or accidental petroleum spills are considered to be ***less than significant***. No mitigation is required.

4.5.4.2 Impacts on Terrestrial Organisms and Habitat

This section provides an analysis of the potential impacts on terrestrial organisms and habitats that exist or could exist in the project area. Potential impacts resulting from restoration of the HWRP site are addressed in the *Hamilton Wetlands Restoration Project EIS/EIR* (USACE 1998*)* and the *Bel Marin Keys V Expansion Project EIS/EIR (*USACE 2003*)*, and is not further addressed in this SEIR/EIS.

It is anticipated that Alternatives 1, 2, and 3 would have the least impact on terrestrial habitats, due to the lack of construction activities in upland areas. Alternative 4, however, would require construction of levees, excavation of an ATF basin adjacent to San Pablo Bay, and subsequent breaching of the levee to provide navigation access from San Pablo Bay to the BMKV basin. Therefore, Alternative 4 is expected to result in greater impacts to terrestrial habitat, compared to the other alternatives.

Birds, Wildlife, and Plant Species

This section provides an overview of sensitive bird, wildlife, and plant species that could reasonably be impacted by project activities:

- **Seabirds:** California brown pelican (*Pelecanus occidentalis californicus*) (Federal Threatened, State Threatened); double crested cormorant (*Phalacrocorax auritus*) (California Species of Concern); and osprey (*Pandion haliaetus*) (California Species of Concern).
- **Other Birds:** California black rail (*Laterallus jamaicensis*) (State Threatened); California clapper rail (*Rallus longirostris obsoletus*) (Federal Endangered, State Endangered); western snowy plover (*Charadrius alexandriunus nivosus*) (Federal Threatened, California Species of Concern); California least tern (*Sterna antillarum browni*) (Federal Threatened, State Endangered); saltmarsh common yellowthroat (*Geothlypis trichas sinuoso*) (California Species of Concern); northern harrier (*Circus cyaneus*) (California Species of Concern); white-tailed kite (*Elanus leucurus*) (California Species of Concern); western burrowing owl (*Athene cunicularia*) (California Species of Concern); and San Pablo song sparrow (*Melospiza melodia*) (California Species of Concern).
- **Terrestrial Mammals:** Saltmarsh havest mouse (*Reithrodontomys raviventris*) (Federal Endangered, State Endangered) and salt marsh wandering shrew (*Sorex vagrans halicoetes*) (California Species of Concern).
- **Plants:** California seabite (*Suaeda californica*) (Federal Endangered, California Native Plant Society [CNPS]-1B); hairless popcorn-flower (*Plagiobothrys glaber*) (CNPS-1A); Pappose tarplant (*Centromadia parryi* spp. *parryi*) (CNPS-1B); Petaluma popcorn flower (*Plagiobothrys mollis* var. *vetitus*) (CNPS-1A); and soft bird's beak (*Cordylanthus mollis* spp. *mollis*) (Federal Endangered, CA-rare, CNPS-1B).

Impact MTB-12: Disturbance to Nesting Birds during Construction, Maintenance, Operation, and Decommissioning

Alternatives 1, 2, and 3

Under Alternatives 1, 2, and 3, replacement and/or maintenance of the dredged material transfer pipeline could disturb approximately 0.07 ac of tidal mudflat habitat; however, no tidal marsh or upland habitat would be disturbed for these alternatives.

Several species of water birds and seabirds nest in colonies in San Francisco Bay, including California gulls, Forester's tern, double-crested cormorant, and others; however, there are no known water bird nesting colonies in the project area. As such, no nesting colonies would be removed, nor would there be any indirect disturbance to nesting colonies as the result of project-related activities. It is unlikely that migratory birds would nest on the pipeline during project operation and no bird species nest in tidal mudflats.

During the course of the 10- to 18-year operation, depending on which alternative is selected, it is possible that a new nesting colony could establish in the general vicinity of the project. Due to limited nesting habitat availability (both natural and semi-natural [double-crested cormorants often nest on power towers]) in the project area there is a low probability of this occurring.

Based on this analysis, it is anticipated that construction, maintenance, operation, and decommissioning of any of the alternatives would have ***no impact*** on nest colonies for the duration of operations.

Alternative 4: Direct Channel to BMKV Basin

Under Alternative 4, approximately 60 ac of upland habitat would be removed for excavation of the BMKV basin and construction of the perimeter levees. This upland habitat can support some waterfowl, raptors, and songbird species during the nesting period; however, water and sea birds are not known to nest in the project area. Removal of these habitats during the migratory bird nesting period (typically March through August) could result in the loss of individuals or their nests. Alternative 4 would result in the loss of 60 ac of upland habitat for the life of the project and following restoration of the HWRP site. The intention of the restoration projects, however, is to restore the upland site to tidal salt marsh and mudflat habitat, rather than leaving it as upland habitat.

Impacts that result in the loss of migratory birds, their nests, or eggs are considered significant. With implementation of **Mitigation Measure MTB-MM-4,** this impact is considered ***less than significant.***

Mitigation Measure MTB-MM-4: Conduct Surveys to Locate Migratory and Special Status Bird Nests, Including Northern Harrier, Burrowing owl and San Pablo Song Sparrow Nest Sites before Construction Is Initiated and Avoid Breeding Sites.

USACE and Conservancy will conduct surveys during the nesting season to locate nest sites of the above-mentioned species in suitable breeding habitats in any area to be impacted within two weeks of any construction disturbance. Surveys for burrowing owls will occur year-round to ensure non-breeding adults are not crushed in their burrows. Surveys will be conducted by a qualified biologist using survey methods approved by CDFG or USFWS. If nests, burrows, or young of these species are not located, construction may proceed. If nest sites are located, a 250-ft construction buffer will be established around the active nest site. If an active owl burrow is located outside of the breeding season, an approved excluder device will be used to ensure that the burrow is not occupied when construction commences. Alternatively, USACE and Conservancy could sequence construction activities to altogether avoid active nesting sites during the breeding season.

Impact MTB-13: Temporary Loss (9 – 18 Years) of Foraging Habitat for Shorebirds, California Clapper Rail, and California Black Rail during Construction, Maintenance, Operation, and Decommissioning

Alternatives 1 through 3

The impacts on foraging habitat for shorebirds, California clapper rail, and California black rail, would be similar under Alternatives 1–3. Most shorebird species forage across the entire mudflat because they can escape predation by flight. Clapper and black rails rarely venture past the fringe between tidal mudflat and tidal salt marsh habitat as they require the cover of marsh vegetation to escape predators. Some shorebirds and the rails in question use tidal marsh for nesting. Under Alternatives 1, 2, and 3, there would be 0.07 ac of tidal mudflats disturbed to replace and/or maintain the dredged material pipeline; salt marsh habitat, however, would not be disturbed. Disturbing mudflat habitat could result in removal of a minor amount of foraging habitat for shorebirds and even less for clapper and black rails. Alternatives 2 and 3 would result in the same amount of mudflat loss as under the authorized off-loader facility (Alternative 1).

Once the infrastructure is constructed and the delivery system is operational, there would be minimal additional impact on foraging and nesting habitat for shorebirds, California clapper rail, and California black rail.

Because construction of Alternatives 1, 2, or 3 would result in only a very small percentage of available mudflat acreage being disturbed and operation would not result in the continued disturbance of mudflats, this impact is considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

In order to excavate a direct channel from San Pablo Bay to the BMKV site, approximately 4 to 10 ac of tidal mudflats would be removed for the duration of the 9-year project; however, no tidal salt marsh habitat would be removed.

Clapper and black rails only forage in the fringe next to tidal marsh; thus the loss of forage habitat for rails is considered less than significant.

This could result in the removal of foraging habitat for shorebirds. While this loss is small relative to the available foraging habitat available in the region, tidal mudflats are considered a 'special aquatic site' by USACE (40 CFR 230.10(a)(3)). Due to the scale of mudflat loss under this alternative, this impact is considered ***significant and unavoidable*** for shorebirds.

Impact MTB-14: Temporary Loss (9 – 18 Years) of Foraging Habitat for Upland Birds, Including the San Pablo Song Sparrow, Saltmarsh Common Yellowthroat, Burrowing Owl, and Northern Harrier during Construction, Maintenance, Operation, and Decommissioning

Alternatives 1 through 3

Under these three alternatives no upland habitat would be removed during construction. A small amount of tidal mudflats would be removed; however, these species would not nest in areas that are regularly inundated. Once the infrastructure is built and the delivery system is operational, there would be minimal additional impact on foraging and nesting habitat for songbirds. Under Alternatives 1, 2, and 3, impacts on foraging habitat for upland bird species are considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Excavation of the BMKV basin and construction of the perimeter would result in the removal of approximately 60 ac of upland habitat that would be converted into tidal salt marsh habitat following restoration of the HWRP site. This upland habitat is primarily agricultural and non-native grassland, but there is the potential for seasonal wetland habitat to occur within those areas. Removal of these areas could result in the removal of foraging and potential nesting habitat for songbirds that would remain for the duration of the project. The upland agricultural and grassland areas are also potential nesting and foraging habitat for northern harriers and burrowing owls. This loss is small relative to the available agricultural, grassland and seasonal wetland habitat in the region and thus this impact is considered ***less than significant***. No mitigation is required.

Impact MTB-15: Disturbance to Bird Species due to Project-Related Noise

Alternatives 1 through 3

Noise, vibration, visual, and proximity related disturbances associated with construction could disturb bird species that nest and forage in tidal mudflat and tidal marsh habitats, including special-status species such as California black rail, California clapper rail, saltmarsh common yellowthroat, and San Pablo song sparrow. If these species are nesting on or adjacent to the site during replacement and/or maintenance of the transfer pipeline, individuals could be displaced from high-quality foraging habitat, or nesting birds could abandon nests as the result of high noise levels or other project-related construction activity. Aside from abandonment, breeding success of bird species could be reduced if disturbances impede the ability of adults to properly care for their eggs or young. While unlikely, the potential for this impact exists, and any impact on nesting birds in the tidal marsh is considered significant.

For operations under Alternatives 1, 2 and 3, there would be minimal noise or disturbance within the intertidal or tidal habitats crossed by the delivery pipeline, related primarily to pump station operation.

With implementation of **Mitigation Measure MTB-MM-5**, potential impacts on nesting birds in the tidal marsh are considered ***less than significant***.

Mitigation Measure MTB-MM-5: Restrict Construction Activity within 250 feet of Tidal Marsh Habitat to the Non-Breeding Season.

The USFWS recommends a window for the protection of nesting California clapper rails from March 1 through August 31 of each year. USACE and Conservancy will not allow construction activity within 250 feet of any tidal marsh habitat during this protective window. This measure would protect other birds nesting in the marsh from disturbance as well. If an emergency occurs that requires activity along the pipeline route through the marsh (on a raised roadway) or within 250 feet of the marsh edge, USACE and Conservancy would conduct surveys for clapper rails and for other nesting birds and would consult with the USFWS. A USFWS approved biologist would be on site for any emergency activity within 250 feet of the marsh. At no time will construction activity be allowed within tidal marsh habitat.

Alternative 4: Direct Channel to BMKV Basin

Noise, vibration, visual, and proximity related disturbances associated with construction could disturb bird species that nest and forage in tidal flat and upland habitats, including special-status species such as the northern harrier, burrowing owl and San Pablo song sparrow. If these species are nesting on or adjacent to the site during the excavation of the BMKV basin, individuals could be displaced from foraging habitat, or nesting birds could abandon nests as the result of high noise levels or other project-related construction activity. Aside from abandonment, breeding success of bird species could be reduced if disturbances impede the ability of adults to properly care for their eggs or young. While unlikely, the potential for this impact exists, and any impact on nesting upland migratory and special status birds is considered significant.

Operations under Alternative 4 would generate noise during transit of the delivery vessels adjacent to shorebird, songbird, and other special status bird species where the direct channel crosses tidal and intertidal habitats. However, given this is an ongoing operations birds will adjust their nesting behavior in the immediate proximity of the facility and either move their nesting further from the facility or will accommodate to facility activities such that nest abandonment would not be expected.

Implementation of **Mitigation Measure MTB-MM-4** would reduce this impact to a ***less than significant*** impact.

Impact MTB-16: Short-term (9 – 18 Years) Loss and/or Degradation of Tidal Mudflat Habitat during Construction, Maintenance, Operation, and Decommissioning

Alternatives 1 through 3

Replacement and/or maintenance of the primary delivery pipeline, including placement of the concrete pads (should they be necessary), under Alternatives 1, 2, and 3 would result in disturbance of 0.07 ac of tidal mudflat habitat. Annual maintenance dredging of the ATF basin and access channel (should a channel be constructed) under Alternatives 2 and 3 would remove sediments from San Pablo Bay and may cause minor erosion of surrounding mudflat habitat.

The HWRP will, in time, create approximately 70 ac of tidal mudflat and intertidal channels (Jones & Stokes 1998; Jones & Stokes 2003). There could be temporal losses of tidal mudflat during operation of the proposed ATF, but full implementation of the restoration projects would provide large new expanses of mudflat habitat. At the end of ATF basin operation, the potential loss of sediment supply would end.

Redirection of dredged material could also result in changes in sedimentation in nearby mudflats. Overall, many of the impacts that could result from the change in San Pablo Bay's sediment budget through annual erosion and deposition at the ATF basin and direct channel are somewhat speculative, and their potential extent, duration and intensity are difficult to measure. However, it is expected that any sedimentation and/or erosion resulting from operation of any of the alternatives would result in only minor loss of existing mudflat habitat. Further, following restoration of the HWRP site, sediments redirected to the sites would be reintroduced to San Pablo Bay and the existing mudflat habitat would be stabilized.

Based on this analysis, the potential loss of mudflat resulting from construction, maintenance, operation, and decommissioning Alternatives 1, 2, or 3 is considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Alternative 4 would result in approximately 4 to 10 ac of tidal mudflat habitat removed during excavation of the direct channel from San Pablo Bay to the BMKV basin. The impacted area would return to mudflat once dredged material placement is complete. The loss of mudflat habitat would persist for the 18-year duration of this alternative and, therefore, would not necessarily be considered temporary. Following restoration of the HWRP site, however, there would be development of tidal mudflat habitat and intertidal channels, once tidal flow is returned to the restoration sites. However, this newly established tidal mudflat habitat would not offset the losses accrued. Tidal mudflats are considered a 'special aquatic site' by USACE (40 CFR 230.10(a)(3)). These areas possess "special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values." As such, this scale of mudflat loss is considered ***significant and unavoidable***.

Impact MTB-17: Short-term (9 – 18 Years) Loss and/or Degradation of Tidal Salt Marsh Habitat during Construction, Maintenance, Operation, and Decommissioning

All Alternatives

Construction of Alternatives 1, 2, 3, or 4 would not result in the loss or degradation of tidal salt marsh habitat (core habitat for the salt marsh harvest mouse and California clapper rail). Some portions of the BMKV outboard levee may provide refugia for salt marsh harvest mice; however, the potential for direct loss due to the proposed action and alternatives is expected to be minimal, since salt marsh habitat would not be affected. As such, construction that would occur under all four alternatives would have ***no impact*** on tidal salt marsh habitat.

Long-term operation of the dredged material delivery pipeline results in wear of the pipeline walls and joints between segments (for Alternatives 1, 2, and 3 only). It is common practice to rotate the pipe periodically and to replace segments as they get too thin. However, there is a potential for such wear to result in leakage of dredged material slurry from the pipeline. Tidal marsh habitat exists within 50 feet of either side of the pipeline and could be affected in the event of an unchecked spill. While unlikely, destruction of tidal marsh habitat due to a pipeline spill is considered significant. To reduce impacts to tidal marsh habitat to a ***less than significant*** level, USACE, Conservancy, or successors in interest would implement **Mitigation Measure MTB-MM-5**.

Mitigation Measure MTB-MM-5: Periodic Inspection of the Dredged Material Delivery Pipeline in the Tidal Marsh Area.

In addition to standard maintenance practices and pressure monitoring, the pipeline will be inspected visually on a daily basis where it crosses the tidal marsh. Any leaks or obvious signs of damage would be reported immediately to USACE's construction representative. A clear line of authority will be established to shut down pumping operations in the unlikely event of a leak.

Impact MTB-18: Loss of Special-Status Plant Species and/or Habitat for Special-Status Plant Species during Construction, Operation, Maintenance, and Decommissioning

All Alternatives

The six special-status plant species that could exist in the project area include: California seablite, hairless popcorn flower, pappose tarplant, Petaluma popcornflower, Point Reyes bird's-beak, and soft bird's-beak. All of these species are associated either with tidal salt marsh or habitats not present on or near the project site. Since salt marsh would not be disturbed during construction, operation, and maintenance of all alternatives, there would therefore be ***no impact*** on special-status plant species.

Impact MTB-19: Short-term (9 –18 Years) Loss of Upland Habitats, Including Agricultural Land and Non-Tidal Wetlands

Alternatives 1 through 3

Replacement and/or maintenance of the current pipeline under Alternatives 1, 2, and 3 would not result in the loss of upland or agricultural lands on the BMKV site. Once the infrastructure is built and selected alternative is operational, there would be minimal additional impact on terrestrial habitats related to this project. It is anticipated that construction, maintenance, operations, and decommissioning of these alternatives would have a ***less than significant impact*** on agricultural lands and non-tidal wetlands. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Under Alternative 4 approximately 60 ac of upland and agricultural lands would be removed as the result of excavating the BMKV basin. Since the intent of the HWRP is to eventually restore the site to a tidal system, the replacement of agricultural lands in this area was addressed fully in the BMKV SEIS/EIR (Jones & Stokes 2003). The biological values offered by agricultural lands, while important, are not a limiting biological factor for special-status or other native species on the BMKV site. Once the restoration projects are completed, the agricultural lands lost during construction would be permanently converted to an aquatic system. Based on this analysis, this impact is considered to be ***less than significant*** under Alternative 4. No mitigation is required.

Impact MTB-20: Indirect Degradation of Tidal Mudflat and Tidal Salt Marsh Habitat Resulting from Uptake of Mercury by Vegetation due to Project Construction and Maintenance during Construction, Operation, Maintenance, and Decommissioning

All Alternatives

Construction of all four alternatives, including excavation for the ATF and BMKV basins, the direct channel alignment, and replacement and/or maintenance of the dredged material transfer pipeline, could potentially disturb aquatic sediment containing mercury and could potentially lead to uptake of mercury by terrestrial and aquatic vegetation. Periodic excavation needed to keep channels operational during the life of the project could further mobilize aquatic sediment that contains mercury. However, because mercury is already accessible to both terrestrial and aquatic plants in tidal habitat in the project area (see Section 4.4, *Water and Sediment Quality*), and because only a small amount of mercury would be released to the environment by construction and operations, the project is not expected to significantly increase the current uptake of mercury by tidal vegetation. Hence, the impact on tidal mudflat or tidal salt marsh habitat resulting from uptake of additional mercury during project construction or operation is considered ***less than significant***. No mitigation is required.

Impact MTB-21: Introduction or Spread of Noxious Weeds during Construction, Operations, Maintenance, and Decommissioning

All Alternatives

Construction and maintenance activities surrounding the transfer pipeline have the potential to introduce invasive nonnative plant species not presently found in the project area, and could also promote the spread of nonnative plants that now occur on the site. Such species could displace native plants, potentially changing the species composition on or around the construction area. With implementation of **Mitigation Measure MTB-MM-6,** the potential for construction activities to introduce or spread invasive species within the construction area are considered ***less than significant.***

Mitigation Measure MTB-MM-6: Implement Measures to Avoid the Introduction and Spread of Invasive Plants.

USACE and Conservancy will be responsible for avoiding the introduction of new invasive plants and the spread of invasive plants previously documented in the project area. Accordingly, the following measures will be implemented during construction.

- Construction supervisors and managers will be educated about invasive plant identification and the importance of controlling and preventing the spread of invasive plant infestations.
- Surface disturbance within the construction work area will be minimized to the greatest extent possible.
- All disturbed areas will be seeded with certified weed-free native mixes and mulched with certified weed-free mulch.
- Native, non-invasive species will be used in erosion control plantings to stabilize site conditions and prevent invasive species from colonizing.
- Clean construction equipment immediately prior to being transported to the project vicinity.

Impact MTB-22: Compliance with the Goals of the CCMP and San Francisco Bay LTMS

All Alternatives

The CCMP was mandated by Congress when the CWA was reauthorized in 1997 (CWA Section 320). The CCMP, updated in 2007, serves as a blueprint to guide planning efforts to restore and enhance estuaries. The CCMP outlines specific goals and objectives for San Francisco Bay, including reducing in-Bay disposal, beneficially using dredging material, protecting aquatic organisms, and restoring aquatic habitats. One of the main goals of the LTMS is to reduce the impacts on aquatic resources resulting from in-Bay disposal by beneficially using 40% of material dredged from San Francisco Bay dredging projects, disposing 40% at ocean disposal sites (SF-8 and SF-DODS), and disposing only 20% at in-Bay sites.

Overall, all alternatives would allow for the goals of the CCMP and LTMS to be furthered by providing a mechanism to reducing in-Bay disposal, beneficially use dredged material, and restore approximately 2,200 ac of wetland habitat. These alternatives allow for the following CCMP objectives to be realized:

- Objective DW-3: Develop a comprehensive regional dredging strategy. Specifically, the alternatives allow for Action DW-3.2, beneficially using dredged material.
- Objective DW-4: Encourage use of dredged material for restoration projects. The alternatives would allow for approximately 1.2 to 1.6 mcy on average of dredged material to be beneficially used for wetland restoration each year (up to 1.5 to 3.6 mcy in maximum cases).
- Objective AR-3: Implement recovery actions for threatened and endangered species. Restoration of the HWRP site would provide valuable habitat of high quality for several listed species, including saltmarsh harvest mouse, and California clapper rail. Additionally, by reducing in-Bay disposal, the resulting effects of increases suspended sediment and potential release and bioavailability of constituents of concern on protect aquatic species (e.g., salmonids and green sturgeon) would be reduced.

- Objective AR-7: Protect, enhance, and restore subtidal habitats. Reducing in-Bay disposal and restoring the HWRP site would improve water quality in San Francisco Bay by reducing concentrations of suspended sediment and associated constituents of concern.

- Objective WT-4: Expand wetland base. Restoration of the HWRP site would expand the existing San Francisco Bay Area wetland base by approximately 2,200 ac.

Each alternative would meet the goals of the CCMP and LTMS by reducing in-Bay disposal, beneficially using dredged material, and creating approximately 2,200 ac of wetland and aquatic habitat at the HWRP site. Overall, the alternatives would result in a ***beneficial impact*** on aquatic and terrestrial resources in San Francisco Bay.

Section 4.6

Potential Impacts to Environmental Justice, Population, and Housing

4.6.1 Definition of Key Terms

4.6.1.2 Environmental Justice

EPA defines environmental justice as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies” (EPA 2005).

Minority Populations

Minority populations consist of individuals who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (U.S. Bureau of Land Management [BLM] 2002)).

Low-Income Populations

The U.S. Census Bureau defines a low-income population in an affected area as one with an annual household income of 80% or less of the median household income of the general population (BLM 2002).

4.6.2 Methodology for Impact Analysis

4.6.2.1 Impact Mechanisms

To determine whether the project alternatives would be likely to result in disproportionately high and adverse human health or environmental effects on low-income and minority populations, demographic information was obtained on the potential areas of effect (the communities situated along the San Pablo Bay shoreline). The definitions of minority and low-income populations used for the purposes of this environmental justice analysis are those of the Council on Environmental Quality, whose definitions are widely used to assess environmental justice in the environmental review process. Disproportionate effects were determined according to the following criteria:

- where the minority population percentage of the affected area (communities situated along San Pablo Bay) is greater than 50% of the minority population percentage of the general population (combined counties); and
- where the population percentage of the affected area (communities situated along San Pablo Bay) is below the annual poverty threshold defined by the U.S. Census Bureau as 80% or less of the household median income of the general population (associated county).

In addition to other potential impacts, the ensuing analysis addresses subsistence fishing, rather than commercial fishing. Effects on commercial harvesting (fishing or otherwise) are not related to the issue of environmental justice and are therefore not discussed in this section. Potential for commercial fishing impacts are discussed in Section 4.9, *Recreation and Commercial Fishing*.

4.6.3 Thresholds of Significance

For the purposes of this analysis, an impact was considered to be significant and to require mitigation if it would:

- induce substantial population growth;
- displace a substantial number of existing housing units or people, necessitating construction of replacement housing;
- result in disproportionately high and adverse human health effects (including, bodily impairment, infirmity, illness, or death); or
- result in disproportionately high and adverse environmental effects (including effects on the natural or physical environment) that would substantially and adversely affect minority, low-income, or Native American populations.

A disproportionate effect is defined as one that is predominantly borne, more severe, or of a greater magnitude in areas with environmental justice populations than in other areas.

4.6.4 Impacts and Mitigation Measures

The following table summarizes the impacts and the significance determinations for each of the alternatives, relative to Environmental Justice, Population and Housing.

A disproportionate effect is defined as one that is predominantly borne, more severe, or of a greater magnitude in areas with environmental justice populations than in other areas.

4.6.4 Impacts and Mitigation Measures

The following table summarizes the impacts and the significance determinations for each of the alternatives, relative to Environmental Justice, Population and Housing.

Table 4.6-1. Summary of Population and Housing Impacts and Environmental Justice

Impacts	**Alternative 1: Dredged Material Off-Loader Facility (No Action)**	**Alternative 2: Unconfined In-Bay ATF (Proposed Action)**	**Alternative 3: Confined In-Bay ATF**	**Alternative 4: Direct Channel to BMKV Basin**
Impact POP-1: Induce Substantial Population Growth	Less than Significant	Less than Significant	Less than Significant	Less than Significant
Impact POP-2: Displace People or Housing	No Impact	No Impact	No Impact	No Impact
Impact POP-3: Have Disproportionately High and Adverse Human or Environmental Effects on Disadvantaged Communities	**Water Quality** Less than Significant **Air Quality** Less than Significant **Noise** No Impact	**Water Quality** Less than Significant with Mitigation **Air Quality** Less than Significant **Noise** No Impact	**Water Quality** Less than Significant with Mitigation **Air Quality** Less than Significant **Noise** No Impact	**Water Quality** Less than Significant with Mitigation **Air Quality** Less than Significant **Noise** No Impact

Impact POP-1: Induce Substantial Population Growth

All Alternatives

The construction and operation of the proposed action under all alternatives may result in the creation of a small number of jobs; however, this employment would be minimal and temporary. The jobs created by this project would not induce growth in the area or require additional housing to be built for employees. This impact is considered ***less than significant*** under all four alternatives. No mitigation is required.

As discussed in Section 4.12, *Air Quality*, emissions resulting from increased mechanical/vessel use in San Pablo Bay will not exceed the general conformity thresholds for criteria pollutants (100 tons for NOx, ROG/VOC, and CO) and therefore potential for degraded air quality near populations of concern is considered a ***less than significant*** impact. Furthermore, the considerable distance between the location of the in-Bay ATF (Alternatives 2 and 3), the direct channel and BMKV basin (Alternative 4), and the populations of concern surrounding San Pablo Bay would result in no disproportionate air or noise impacts on disadvantaged communities.

A potential environmental justice impact may result if fish, which are relied on as a major food source for subsistence harvesting, experience increased toxicity due to project-related activities. Humans are exposed to a specific chemical form of mercury called methylmercury when eating fish and shellfish. Methylmercury is generally more toxic than the elemental form of mercury; however, its toxicity is dependent on a number of factors, including dose and duration of exposure (EPA 2007). The primary human health concern resulting from overexposure to methylmercury is for fetuses, infants, and children.

Little is known about the specific fishing habits of subsistence fishers residing along San Pablo Bay. However, a study conducted by the California Department of Health Services (DHS) between 1998 and 1999 sheds light on the general fishing habits of anglers fishing in San Francisco Bay. To date, this study is the most comprehensive report on fishing and consumption habits in the Bay Area and makes general assumptions about the project area. It should be noted, however, that this study is not definitive, but rather, it represents a snapshot of fishing practices in various locations throughout San Pablo Bay. All participants were voluntary and happened to be present at the same time and place as the interview team.

According to DHS, approximately 80% of anglers surveyed consumed San Francisco Bay–caught fish an average of one meal or fewer per month (California DHS 2001). This data indicates that a majority of anglers fishing in San Francisco Bay follow the recommendations set forth in the health advisory; however, up to 20% of them eat more than the advised amount. The study found that Asian and African American groups were more likely than any other ethnic groups to consume more than the recommended limit and thus, are at greatest risk of toxic exposure. Based on the demographic data shown in Tables 3.6-2 and 3.6-3, within the project area the communities of Vallejo, Rodeo, Pinole, Hercules, and Richmond are the most likely to be sensitive to chemical exposure from subsistence fishing.

Alternative 1: No Action

Environmental considerations for Alternative 1, the existing dredged material off-loader facility, were addressed in the HWRP EIS/EIR and BMKV SEIS/EIR. The findings of previous analyses included in this SEIS/EIR indicate that project operation (including the transport and placement of dredged materials at the HWRP and BMKV sites) would not increase the levels of mercury found in San Pablo Bay sediments since incoming dredged material would not contain elevated levels of mercury relative to the ambient levels of mercury that area already existing sediment in the Bay (see Section 4.4, *Water and Sediment Quality,* for detailed information regarding project effects on sediment quality). In addition, this alternative has low potential to remobilize mercury into the water column since disposal materials would be transferred directly from scows to the dredged material pipeline. Therefore, this impact is considered ***less than significant***. No mitigation is required.

Alternatives 2 and Alternative 3:

Under Alternatives 2 and 3, the construction and operation of the in-Bay ATF has the potential to temporarily increase mercury concentrations levels in a small, localized area due to the initial excavation of the ATF basin and construction of the pipeline, as well as disturbance of sediments during placement and reuptake of material. As discussed in Section 4.4, *Water and Sediment Quality*, prior to exact site selection and excavation of the proposed ATF basin, an SAP would be prepared to test materials for possible contamination, including mercury levels that may be elevated beyond ambient levels. Excavation and disposal BMPs to protect water and sediment quality would also be implemented. With these measures in place, the likelihood of increased contamination and associated health risks to environmental justice communities reliant on subsistence fishing in San Pablo Bay is minimal. With the implementation of **Mitigation Measures WSQ-MM-1, WSQ-MM-2, and WSQ-MM-3,** this impact is considered ***less than significant.***

Alternative 4: Direct Channel to BMKV Basin

Potential impacts to disadvantaged communities due to construction and operation of Alternative 4 would likely be similar to, though potentially greater than, those described above for Alternatives 2 and 3 due to excavation and maintenance of the 22,300-foot-long direct channel. However, as discussed in Section 4.4, *Water and Sediment Quality*, prior to exact site selection and excavation of the proposed access channel and basin for Alternative 4, a SAP would be prepared to test materials for possible contamination, including mercury levels that may be elevated beyond ambient levels. Excavation and disposal BMPs to protect water and sediment quality would also be implemented. With the implementation of **Mitigation Measures WSQ-MM-1, WSQ-MM-2, and WSQ-MM-3,** this impact is considered ***less than significant***

Section 4.7
Potential Impacts to Cultural Resources

4.7.1 Methodology for Impact Analysis

The effects of the alternatives related to cultural resources were assessed based on archival research, a review of relevant literature, a request for information from Native American communities, and information gathered during previous surveys under the HWRP. The impact analysis for archaeological and architectural resources considers of the criteria for eligibility under the National Registry of Historic Places (NRHP), California Register of Historic Resources (CRHR). Analysis of impacts on paleontological resources followed the methodology recommended by the Society of Vertebrate Paleontology (SVP) (Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee 1995).

4.7.1.1 Impact Mechanisms

Impact mechanisms considered in this section include those project-related activities that could potentially impact or uncover known, or previously unidentified cultural and paleontological resources.

4.7.2 Thresholds of Significance

4.7.2.1 Federal Criteria: National Historic Preservation Act Section 106

For federal projects, cultural resource significance is evaluated in terms of eligibility for listing in the NRHP. NRHP criteria for eligibility are presented below. 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, or that represent the work of a master, or 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 (36 CFR 60.4).

In addition to meeting the significance criteria, a significant property must possess integrity to be considered eligible for listing in the NRHP. Integrity refers to a property's ability to convey its historic significance (National Park Service 1991). Integrity is a quality that applies to historic resources in seven specific ways: location, design, setting, materials, workmanship, feeling, and association. A resource must possess two, and usually more, of these kinds of integrity, depending on the context and the reasons why the property is significant.

The NHRP criteria also limit the consideration of moved properties because significance is embodied in locations and settings. Under NRHP criterion B, a moved building destroys the integrity of location and setting. A moved property can be eligible if it is significant primarily for architectural value or if it is a surviving property most importantly associated with a historic person or event (National Park Service 1991).

4.7.2.2 CEQA Criteria

Based on significance criteria used by the State Office of Historic Resources and professional practice, the proposed alternatives might have a substantial adverse effect on cultural resources if they would:

- cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines, Section 15064.5;
- cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines, Section 15064.5;
- directly or indirectly destroy a unique paleontological resource or site or unique geologic feature; or
- disturb any human remains, including those interred outside of formal cemeteries.

When determining substantial adverse effects on historical or archaeological resources, the following definitions were used:

- *Substantial adverse change* in the significance of a historical or archaeological resource means physical demolition, destruction, relocation, or alteration of the resource or its immediate surrounding such that the significance of a historical resource would be materially impaired (CEQA Guidelines Section 15064.5[b][1]).
- *Materially impaired* significance of a historical resource means when a project demolishes or materially alters in an adverse manner those physical characteristics that convey its historic significance (CEQA Guidelines Section 15064.5[b][2][A–C]).

4.7.2.3 Society of Vertebrate Paleontology Criteria

As used in the significance criteria adopted for this analysis, the term *significant* refers to paleontological resources that fulfill one or more of the following criteria (Society of Vertebrate Paleontology Conformable Impact Mitigation Guidelines Committee 1995):

- provides important information shedding light on evolutionary trends or helping to relate living organisms to extinct organisms;
- provides important information regarding the development of biological communities;
- demonstrates unusual circumstances in the history of life;
- represents a rare taxon or a rare or unique occurrence;
- is in short supply and in danger of being destroyed or depleted;
- has a special and particular quality, such as being the oldest of its type or the best available example of its type; or
- provides important information used to correlate strata for which it may be difficult to obtain other types of age dates.

Consistent with these criteria, paleontological resources considered significant in California typically include vertebrate remains but may also include invertebrate fossils and plant fossils in some areas. Fossil resources may also have significance because of their importance in documenting past environments including paleoclimates, water depths, and water temperatures.

4.7.3 Impacts and Mitigation Measures

The following table summarizes the impacts and the significance determinations for each of the alternatives, relative to Cultural Resources.

Table 4.7-1. Summary of Cultural Resources Impacts

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact CR-1: Direct or Indirect Impacts to an Archaeological or Historic Resource	No Impact	Less than Significant with Mitigation	Less than Significant with Mitigation	Less than Significant with Mitigation
Impact CR-2: Direct or Indirect Destruction of a Unique Paleontological Resource or Site	Less than Significant	Less than Significant	Less than Significant	Less than Significant

Impact CR-1: Direct or Indirect Impacts to an Archaeological or Historic Resource

Alternative 1: No Action

There are no recorded archaeological or historic resources identified within or adjacent to the project area. Therefore there is ***no impact*** to cultural resources.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Although very unlikely, unidentified prehistoric sites could exist within the project area. Buried shipwrecks and/or airplane remnants could also be present. Because initial excavation of the ATF basin could potentially destroy buried archeological or historical resources, this impact is considered potentially significant. With implementation of **Mitigation Measure CR-MM-1,** this impact is considered ***less than significant***.

Mitigation Measure CR-MM-1: Initiate and Execute Section 106 Consultation and Evaluation Procedures for review by SHPO.

1. USACE and Conservancy shall initiate Section 106 Consultation by identifying the presence of significant cultural resources (if any) within the APE, which are found to contribute to the quality of significance in American history, architecture, archeology, and culture and are 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, or that represent the work of a master, or 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 (36 CFR 60.4).

   In addition to meeting the significance criteria, a significant property must possess integrity to be considered eligible for listing in the NRHP. Integrity refers to a property's ability to convey its historic significance (National Park Service 1991). Integrity is a quality that applies to historic resources in seven specific ways: location, design, setting, materials, workmanship, feeling, and association. A resource must possess two, and usually more, of these kinds of integrity, depending on the context and the reasons why the property is significant.

   The NHRP criteria also limit the consideration of moved properties because significance is embodied in locations and settings. Under NRHP criterion B, a moved building destroys the integrity of location and setting. A moved property can be eligible if it is significant primarily for architectural value or if it is a surviving property most importantly associated with a historic person or event (National Park Service 1991).

2. USACE and Conservancy shall conduct a geophysical remote-sensing survey along the transfer pipeline corridor and ATF basin site to detect any potential submerged or sub-bottom

archeological or historical resources (i.e., buried shipwrecks, airplane remnants, ordinance). Depending on the geographic or bathymetric setting, an appropriate remote-sensing field survey may include deployment of a side scan sonar, sub-bottom profiler, or magnetometer to help detect unidentified resources (URS 2006). Careful attention shall be given to the potential for unexploded ordnance along the transfer pipeline alignment; the presence of unexploded ordnance shall be determined to a depth 4 feet below the planned excavation depth (U.S. Department of Defense 2004). A qualified marine archeologist shall review the results of the geophysical survey and provide interpretations to USACE, who shall in turn consult with SHPO. A technical report documenting these efforts and interpreting the results shall be produced.

USACE and Conservancy, or their construction contractor, shall avoid potential submerged or sub-bottom archeological or historical resources detected through the geophysical survey unless they are determined not to be “significant” under Section 106 and or “important” under CEQA (e.g., modern debris, existing infrastructure). Only when a “historic property,” as defined by Section 106, will be adversely affected by the project will USACE explore avoidance impacts.

3. USACE and Conservancy shall conduct supplemental underwater investigations if it is infeasible to avoid potential submerged or sub-bottom archeological or historical resources along the transfer pipeline corridor or ATF basin site. Appropriate supplemental investigations to positively identify targets may include a follow-up diver survey or Remote Operated Vehicle.

   A qualified marine archeologist shall review the results of any supplemental underwater investigation and provide interpretations to USACE, who shall in turn consult with SHPO. If targets are determined to be archeological or historical resources, they shall be evaluated against the NRHP/CRHR significance criteria. If the resources are not eligible for the NRHP/CRHR, then no further consideration of these resources is required. If the resources are eligible for the NRHP/CRHR, data recovery may be required. When data recovery through excavation is the only feasible mitigation, a data recovery plan, which makes provisions for adequately recovering the scientifically consequential information from and about the resource, shall be prepared and adopted prior to any excavation being undertaken. The development of this plan, as well as the implementation of field work, would be conducted in consultation with the SHPO.

If it is determined that the proposed action or alternatives would adversely affect a cultural resource found to be significant under NRHP/CRHR criteria, USACE and Conservancy shall execute a Memorandum of Understanding (MOA) with the SHPO. The MOA would include stipulations for handling and recording of cultural resources that would be affected in consultation with the SHPO. With execution of the MOA, and completion of any and all stipulations of the MOA, USACE and Conservancy would satisfy the requirements of Section 106.

Alternative 3: Confined In-Bay ATF

As described above, unidentified prehistoric sites, buried shipwrecks, or plane remnants could exist within the project area. Because initial excavation of the ATF basin could potentially destroy buried archeological or historical resources, this impact is considered potentially significant. With implementation of **Mitigation Measure CR-MM-1** this impact is considered ***less than significant***.

Alternative 4: Direct Channel to BMKV Basin

As described above, unidentified prehistoric sites, buried shipwrecks, or plane remnants could exist within the project area. Because initial excavation of the BMKV basin or the direct channel could potentially destroy buried archeological or historical resources, this impact is considered potentially significant. With implementation of **Mitigation Measure CR-MM-1,** this impact is considered ***less than significant***.

Impact CR-2: Direct or Indirect Destruction of a Unique Paleontological Resource or Site

Biological remains are commonly considered fossils—hence, the province of paleontology—only when they are older than 10,000 years (pre-Holocene), and in many cases, paleontological sensitivity can be ruled out based on the young age of the materials involved. However, the American Geological Institute's *Glossary of Geology* (Jackson 1997) defines fossil as "[a]ny remains, trace, or imprint of a plant or animal that has been preserved in the Earth's crust since some past geologic or prehistoric time…" Moreover, the SVP's criteria for paleontological significance make no reference to age, focusing instead on the scientific importance and the special or unique qualities of a resource.

The younger portions of the bay mud sequence contain a variety of fossil materials, including foraminifera (e.g., McGann 1995) that have been utilized in studying the history of the San Francisco Bay topographic depression. Influenced by local tectonics, as well as worldwide sea level fluctuations, the history of San Francisco Bay is closely connected to some of the most topical issues in current earth sciences research. These include the evolution of global climates and related changes in sea level, as well as patterns of movement along the San Andreas and related faults. While foraminafera are subjects of paleontological research, it is important to note that foraminifera can be found throughout bay muds in the greater San Francisco Bay and throughout San Pablo Bay (except where prior development or dredging have disturbed the original geological setting).

Key factors from the SVP criteria considered in the analysis of significance are whether potential fossil materials that might be encountered by the project are in short supply and in danger of being destroyed or depleted; has a special and particular quality, such as being the oldest of its type or the best available example of its type; or provides important information used to correlate strata for which it may be difficult to obtain other types of age dates.

The alternatives vary in their extent of disturbance of substrates. However, on the scale of San Pablo Bay, these disturbances are but a small fraction of the overall strata present. Much of San Pablo Bay is not disturbed by the presence of development, dredging, pipelines or other structural intrusions that have altered the underlying subsurface geological strata and the potential fossil material present there. Thus, regardless of which alternative is implemented, there will be extensive areas open for future paleontological study of the history of the San Francisco Bay depression.

Alternative 1: No Action

Alternative 1 would disturb approximately 2.2 ac of underlying bay muds for pile driving to secure the off-loader facility and in-line booster facilities and for replacement of the delivery pipeline. However, the extent of disturbance overall would be limited, and extensive areas of San Pablo Bay not affected by the project would retain intact stratigraphy and fossil content amenable to paleontological research. Consequently, potential impacts on paleontological resources under Alternative 1 are considered to be ***less than significant.*** No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Alternative 2 would disturb approximately 63 ac of underlying bay muds due to excavation of the access channel and ATF basin, pile driving to secure the in-line booster facilities, and for replacement of the delivery pipeline. Although microfossil remains would likely be unaffected, their stratigraphic context would be destroyed. Macrofossils would be subject to a similar loss of context, and could also be physically damaged or destroyed. However, the extent of disturbance overall would be limited and areas of San Pablo Bay not affected by the project would retain intact stratigraphy and fossil content amenable to paleontological research. Consequently, potential impacts on paleontological resources under Alternative 2 are considered to be ***less than significant.*** No mitigation is required.

Alternative 3: Confined In-Bay ATF

Alternative 3 would disturb approximately 46 ac of underlying bay muds due to excavation required for the ATF basin, pile driving to secure the in-line booster facilities and confinement sheet piles, and replacement of the delivery pipeline. However, the extent of disturbance overall would be limited, and unaffected areas of San Pablo Bay would not be affected by the project and would retain intact stratigraphy and fossil content. Consequently, potential impacts on paleontological resources under Alternative 3 are considered ***less than significant.*** No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Alternative 4 would disturb approximately 303 ac of underlying bay muds due to excavation required for the direct channel and the BMKV basin and slumping of the direct channel. However, the extent of disturbance overall relative to the size of San Pablo Bay (66,000 ac) and adjacent dikes baylands would be small, and unaffected areas of San Pablo Bay and diked baylands would not be affected by the project and would retain intact stratigraphy and fossil content. Consequently, potential impacts on paleontological resources under Alternative 4 are considered to be ***less than significant.*** No mitigation is required.

Section 4.8

Potential Impacts to Land Use

4.8.1 Methodology for Impact Analysis

The analysis of land use and planning was qualitative and included consideration of applicable land use policies, plans, and programs.

4.8.2 Impact Mechanisms

The proposed project includes placement of a dredged material aquatic transfer facility within San Pablo Bay, which would include placement and re-dredging/slurry of dredged material within the Bay. Adjacent land use activities would remain as approved under their relevant jurisdiction.

4.8.3 Thresholds of Significance

For the purposes of this analysis, an impact was considered to be significant and to require mitigation if it would:

- conflict or be incompatible with the land use goals, objectives, or guidelines of applicable general plans;
- be inconsistent or conflict with statutes of the California Coastal Act or the goals, objectives, or policies of the BCDC or other applicable state agencies;
- substantially conflict with existing or future adjacent land uses (including agricultural land uses); and
- conflict with existing regional utility infrastructure.

4.8.4 Impacts and Mitigation Measures

The following table summarizes the impacts and the significance determinations for each of the alternatives, relative to Land Use.

Table 4.8-1. Summary of Land Use Impacts

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact LU-1: Consistency with Applicable County and City General Plan Policies	No Impact	Less than Significant	Less than Significant	Significant and Unavoidable
Impact LU-2: Consistency with the San Francisco Bay Plan and/or LTMS Management Plan	Less than Significant	Less than Significant	Less than Significant	Significant and Unavoidable
Impact LU-3: Displacement of Existing Land Uses	No Impact	No Impact	No Impact	Less than Significant
Impact LU-4: Conflict with Existing Utilities and Utility Easements	No Impact (NSD); Less than Significant (PG&E)	No Impact (NSD); Less than Significant (PG&E)	No Impact (NSD); Less than Significant (PG&E)	No Impact (NSD); Less than Significant (PG&E)
Impact LU-5: Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to Non-Agricultural Use	No Impact	No Impact	No Impact	Less than Significant

Impact LU-1: Consistency with Applicable County and City General Plan Policies

Alternatives 1–3 are consistent with applicable county and city policies that support the enhancement of the wildlife and aquatic habitat value of the diked historic marshlands along San Pablo Bay. Alternative 4 is not consistent with all the county and city *General Plan* policies, as described below. A specific land use policy consistency analysis for relevant policies is provided in Table 4.8-2, which is included at the end of this section.

Implementation of all four alternatives would facilitate restoration of tidal wetlands habitats at the HWRP and BMKV sites through beneficial use of dredged material. As such, all alternatives are consistent with Marin County policies supporting wetlands habitat protection in Bayfront Conservation Areas (EQ 2.42, EQ 2.43, EQ-2.50, and EQ 2.51). Given this emphasis in the County policies, facilitation of higher quality wetlands restoration in the Novato Creek and San Pablo Bay ecosystems than those present today is a high priority.

Alternative 1: Dredged Material Off-Loader Facility (No Action)

Alternative 1 is consistent with all identified city and county *General Plan* policies for the bayfront lands. Therefore, there is ***no impact***. No mitigation is required.

Alternatives 2 and Alternative 3:

Alternatives 2 and 3 are consistent with all identified city and county General Plan policies for the bayfront lands. Any potential land use impact resulting from these alternatives is considered ***less than significant.*** No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Initial channel excavation and subsequent shoaling for Alternative 4 would result in significant disturbance of both subtidal (119–233 ac) and mudflat (5–11 ac) habitats. The Direct Channel would be constructed from the vicinity of the existing SF-10 in-Bay disposal site across shallow baylands to a transfer basin at the BMKV site. This alternative would result in substantial direct and indirect impacts on wildlife and aquatic habitats in San Pablo Bay and would, therefore, conflict with the following city and county General Plan policy EQ-2.44, which is intended to protect such habitats from degradation (see Table 4.8-2). This impact is considered ***significant and unavoidable***.

Impact LU-2: Consistency with the San Francisco Bay Plan and/or LTMS Management Plan

Alternatives 1–3 are consistent with the *San Francisco Bay Plan* and LTMS *Management Plan* and Alternative 4 is not consistent with the *San Francisco Bay Plan* and LTMS *Management Plan*, as described below and summarized in Table 4.8-2**.**

Alternatives 1 through 3:

Alternatives 1–3 are consistent with applicable policies and programs in the San Francisco Bay Plan and LTMS Management Plan.

The *San Francisco Bay Plan* contains policies and programs that support habitat enhancement and restoration, protection of Bay water quality, and beneficial use of dredged materials in accordance with the LTMS *Management Plan*. The HWRP and BMKV sites are two of the existing and potential locations identified by the LTMS *Management Plan* for beneficial use of materials dredged from San Francisco Bay. Alternatives 1, 2, and 3 would directly facilitate tidal wetlands restoration at the HWRP and BMKV sites and, therefore, directly implement the related measures identified in the San Francisco Bay LTMS *Management Plan*.

Implementation of these alternatives would support the San Francisco Bay LTMS goal of decreasing in-Bay disposal of dredged material over the next decade. Therefore, this impact is considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

As described above, initial channel excavation and subsequent shoaling for Alternative 4 would result in significant disturbance of both subtidal (119–233 ac) and tidal mudflat (5–11 ac) habitats. Because this alternative would result in substantial direct and indirect impacts on existing San Pablo Bay tidal mudflat habitats, it would conflict with multiple *San Francisco Bay Plan* policies that intend to protect such habitats from degradation, as well as the LTMS *Management Plan* policy addressing the location of rehandling facilities (see Table 4.8-2). Therefore, this impact is considered ***significant and unavoidable***.

Impact LU-3: Displacement of Existing Land Uses

Alternatives 1 through 3:

Construction and operation of a dredged material rehandling facility in San Pablo Bay (Alternatives 1–3) would not result in the displacement of residences, offices, or industrial facilities on the adjacent shoreline. The alternatives, as proposed, would facilitate the beneficial use and restoration of wetlands habitat at the HWRP. Potential impacts to the existing land uses on the HWRP or BMKV site would not be significant, as those land uses would remain during construction and operation of all alternatives. Additionally, these impacts were addressed in the HWRP EIS/EIR and BMKV SEIS/EIR and were found to be insignificant. Although mixed urban and open space uses line San Pablo Bay in nine adjacent communities, these land uses would not be displaced by dredged material placement activities at either the HWRP or BMKV site. Therefore, there would be ***no impact*** under all three alternatives.

Alternative 4: Direct Channel to BMKV Basin

Although the construction and operation of the BMKV basin would conflict with the existing land use of farming and open space on this site, the change in land use would be temporary, with the primary purpose of facilitating beneficial use of dredged materials for the restoration of wetlands under the HWRP. Impacts on the existing land uses were addressed in the HWRP EIS/EIR and the BMKV SEIS/EIR and found to be insignificant, as discussed above. Other impacts such as noise and viewshed interruption on the adjacent Bel Marin Keys Community are addressed in those respective sections in this SEIS/EIR. Therefore, this impact is considered ***less than significant***. No mitigation is required.

Impact LU-4: Conflict with Existing Utilities and Utility Easements

The Novato Sanitary District (NSD) has an easement for a 54-inch outfall force main located on the BMKV site and SLC parcel, parallel to the HWRP perimeter levee.

Pacific Gas and Electric (PG&E) supplies power for the primary offshore booster pump, secondary landside booster pump, and water discharge pump from the high tension tower located in the far west corner of the BMKV site near Bel Marin Keys Boulevard. The high voltage power is stepped down (transformed to lower voltage) at the substation. Power poles and a power line extend along the HWRP perimeter levee, turning south near the outboard levee to a landside booster pump near the offshore pipeline. Power cables extend along the pipeline out to the offshore booster pump station and the existing off-loader facility. In addition, the power poles and line extend east from the Bel Marin Keys residential area across the BMKV site to supply electricity to a stormwater discharge pump near the BMKV outboard levee. The power line and pump are situated adjacent to the south side of the proposed BMKV basin under Alternative 4.

Alternatives 1 through 3:

The NSD outfall force main discharges to San Pablo Bay north of the proposed transfer pipeline alignment; therefore, proposed activities under Alternatives 1 – 3 would not conflict with this utility and there is ***no impact.***

An existing power cable is currently used for activities under Alternative 1, and runs along the transfer pipeline alignment. The power cable provides power to the existing booster pump and off-loader facility. Proposed activities under Alternatives 2 and 3 might utilize this existing power source. However, no additional energy would be required beyond what is currently being used under Alternative 1; therefore, this impact is considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

There are no known utilities along the proposed direct channel or BMKV basin location. The NSD outfall force main discharges to San Pablo Bay south of the proposed direct channel alignment; therefore, proposed activities under this alternative would not conflict with this utility. There is ***no impact***.

Although the power source under consideration with Alternative 4 is diesel, if electricity were to be required, the extension of power lines to the BMKV basin site would require coordination with PG&E. Similar to Alternatives 2 and 3, no additional energy would be required beyond what is currently being used under Alternative 1. Therefore, this impact is considered ***less than significant***. No mitigation is required.

Impact LU-5: Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to Non-Agricultural Use

The HWRP EIS/EIR and BMKV SEIS/EIR both analyzed the impacts of wetland restoration on farmland uses in the project area and determined that any potential conversion of farmland uses would be less than significant. This SEIS/EIR is limited to the analysis of dredged material delivery impacts of the proposed action and alternatives on farmland.

Alternatives 1 through 3:

None of these alternatives involve any direct conversion of farmland to non-agricultural use; therefore, there is ***no impact.***

Alternative 4: Direct Channel to BMKV Basin

This alternative would convert an approximate 60-ac area (44 ac for the BMKV basin and 16 ac for the temporary basin levee) from agricultural use to a basin and perimeter levee. This land use conversion would occur at a future date with completion of the HWRP. However, under Alternative 4, the land use conversion would occur approximately 15 years earlier at the BMKV site than with the HWRP.

No prime farmland, unique farmland, or farmland of statewide importance would be affected by the conversion of agricultural use at the BMKV site. The site currently supports farmland of local importance. The total amount of land converted (60 ac) would be small relative to the total area of land designated for agricultural use in Marin County (167,000 ac) (San Francisco International Airport 2001). Additionally, much of the site has remained fallow for many years, and therefore the site has not produced substantial crops to support the local agricultural economy.

During the 1997 appraisal of the property by Conservancy, the agricultural potential of the restoration site was assessed and was not considered economically sustainable because of poor drainage, low fertility, and lack of an irrigation supply. The BMKV site was evaluated using the NRCS Land Evaluation Site Assessment (LESA) system and received a score of 53, which is well below the 160 LESA score at which alternative sites should be considered (San Francisco International Airport 2001). Conservancy also consulted with an agricultural advisor at the Southern Sonoma-Marin Resource Conservation District who stated that the land was very poor quality for farming because of similar factors (USACE 2006c).

Therefore, the loss of approximately 60 ac of agricultural land at the BMKV site is considered ***less than significant***. No mitigation is required.

163 **Table 4.8-2.** Land Use Policy Consistency Analysis for All Alternatives

Plan Policy	Consistency Analysis	Alternatives Consistent With Policy?
THE MARIN COUNTYWIDE PLAN		
Policy EQ-2.42: Wildlife and Aquatic Habitats. The County shall preserve and enhance the diversity of wildlife and aquatic habitats found in the Marin County bayfront lands, including tidal marshes, seasonal marshes, lagoons, wetlands, agricultural lands, and low-lying grasslands overlying historical marshlands.	Implementation of any of the alternatives would facilitate restoration of 2,600 ac of tidal wetlands habitat.	Yes
Policy EQ-2.43: Development and Access Limitations in Bayfront Conservation Areas. Development shall not encroach into sensitive wildlife habitats, limit normal range areas, create barriers which cut off access to food, water, or shelter, or cause damage to fisheries or fish habitats. Buffer zones between development and identified or potential wetlands areas shall be provided. On residential or industrial parcels which are already filled and at least 5% developed, minor redevelopment involving less than 25% of the structure may be excluded from policies which apply to the BCZ. No additional fill will be allowed. Access to environmentally sensitive marshland and adjacent habitat shall be restricted, especially during spawning and nesting seasons.	The project is not development. Implementation of any of the alternatives would facilitate restoration of 2,600 ac of tidal wetlands habitat. No urban development would encroach into sensitive wildlife habitats.	Yes
Policy EQ-2.44: Tidelands Subzone. The purpose of this subzone is to define those areas which should be left in their natural state because of their biological importance to the estuarine ecosystem. The County shall prohibit diking, filling, or dredging in areas subject to tidal action (Tidelands subzone) unless the area is already developed and currently being dredged. Current dredging operations for maintenance purposes may continue subject to environmental review, if necessary. In some cases, exceptions may be made for areas which are isolated or limited in productivity. In tidal areas, only land uses which are water-dependant shall be permitted, as consistent with federal, state, and regional policy. These include, but are not limited to: ▪ ports ▪ water-related industry and utilities ▪ essential water conveyance ▪ wildlife refuge ▪ water-oriented recreation Exemptions may be granted for emergency or precautionary measures taken in the public interest, e.g. protection from flood or other natural hazards. Removal of vegetation shall be discouraged. Alteration of hydrology should only be allowed when it can be demonstrated that the impact will be beneficial or non-existent.	Implementation of any of the alternatives would facilitate restoration of 2,600 ac of tidal wetlands habitat. Alternative 1 currently exists and has disturbed 1.5 ac of subtidal habitat. Alternatives 2 and 3 would disturb 40 ac of subtidal and intertidal habitat. Alternative 4 would disturb 123 to 243 ac of subtidal and intertidal habitat. On a relative scale of number of acres impacted per alternative, Alternative 4 is inconsistent with this policy due to the scale of disturbance.	Yes, except Alternative 4 due the scale of disturbance relative to the other alternatives.

Plan Policy	Consistency Analysis	Alternatives Consistent With Policy?
Policy EQ-2.50: Coordination with Trustee Agencies within Bayfront Conservation Areas. The County shall facilitate consultation and coordination with the trustee agencies (DFG, USFWS, USACE, EPA, RWQCB, and BCDC) during environmental review and during review of other proposals for lands within the BCZ.	USACE and Conservancy have coordinated with trustee agencies regarding the project.	Yes
Policy EQ-2.51: Minimal Impacts within Bayfront Conservation Zone. The County shall ensure that development in the County occurs in a manner which minimizes the impact of earth disturbance, erosion, and water pollution within the BCZ.	The project is not development. Construction and operation of the alternatives would be conducted in a manner to minimize environmental impacts. This SEIS/EIR assesses and mitigates potential impacts associated with the alternatives.	Yes
Policy EQ-2.54: Tides and Currents. The development of jetties, piers, outfalls, etc., should not be allowed to alter the movement patterns of the bay's tides and currents, such that significant adverse impacts would result.	Section 4.3 assesses potential project impacts associated with water circulation. The alternatives would result in minor changes in water circulation in the Bay, impacts found to be less than significant	Yes
Policy EQ-2.55: Bay Fill. The County shall discourage any bay fill that diverts and retards currents, increases the deposition of sediments, or causes erosion and pollution.	Alternatives 2 and 3 would result in temporary placement of dredged material. Any impacts from the temporary bay fill, addressed in Section 4.3, *Circulation and Sedimentation*, will be less than significant,	Yes
Policy EQ-2.72 Viewshed Protection: The County shall protect visual access to the bayfront and scenic vistas of water and distinct shorelines through its land use and development review procedures. This viewshed protection is essential for the preservation of Marin County and San Francisco Bay identity, for the enhancement of aesthetic qualities, and for visual and psychological relief from adjacent urban environments.	The project is not development. Section 4.14 addresses aesthetic impacts of the project. Construction and operation of the alternatives would not degrade visual access to the bayfront.	Yes
Policy EQ-2.74 Design of Waterfront Development. Waterfront development should be designed for openness and to permit optimal views for public enjoyment of the bayfront.	The project is not development. Section 4.14 addresses aesthetic impacts of the project. Construction and operation of the alternatives would not degrade visual access to the bayfront.	Yes

Plan Policy	Consistency Analysis	Alternatives Consistent With Policy?
CONTRA COSTA COUNTY GENERAL PLAN 2005–2020		
Policy 8-97. The County shall oppose construction or operation of mooring facilities posing significant hazards or threats to Bay or Delta resources.	Alternative 1 currently exists and includes mooring facilities for use by scows and barges while dredged material is transferred to an off-loader. This was evaluated in the 1998 HWRP EIS/EIR and does not pose a significant hazard or threat to Bay or Delta resources. Section 4.11 assesses, and mitigates where necessary, potential project impacts associated with marine transportation and navigation.	Yes
Policy 9-43. Regional scale public access to scenic areas on the waterfront shall be protected and developed, and water-related recreation, such as fishing, boating, and picnicking, shall be provided.	The alternatives would only restrict access to a very small portion of the Bay, and would not conflict with public access to the shoreline and open bay at large.	Yes
CITY OF NOVATO GENERAL PLAN		
EN Policy 12: Bayland Area Protection. Regulate development in the Bayland Overlay Zone so that it does not encroach into wetlands or sensitive wildlife habitats, provided that this regulation does not prevent all use of a property. Discourage human activity that damages fisheries, or habitat for birds, fish, or other wildlife.	The project is not development. Implementation of any of the alternatives would facilitate restoration of 2,600 ac of tidal wetlands habitat. No urban development would encroach into sensitive wildlife habitats.	Yes
EN Policy 14: Tidal Areas. Cooperate with state and federal agencies to ensure that areas subject to tidal action remain in their natural state.	USACE and Conservancy have coordinated with local, state, and federal agencies regarding the project. The project would facilitate the return of large areas to tidal action.	Yes
EN Policy 16: Public Access and Water-Oriented Uses. Encourage public access to shoreline areas, consistent with wildlife and habitat protection and safety considerations. Allow water-oriented uses such as public access, docks and piers, and low-intensity recreational and educational activities which provide or protect wetland or wildlife habitat,	The alternatives would not conflict with public access to the shoreline and open bay. Implementation of any of the	Yes

Plan Policy	Consistency Analysis	Alternatives Consistent With Policy?
and which do not require diking, filling, or dredging. Encourage restoration to tidal status, and seasonal wetlands. Allow use of shoreline areas for flood basins, and wastewater reclamation.	alternatives would facilitate restoration of 2,600 ac of tidal wetlands habitat.	
EN Policy 17: Inter-Agency Coordination. Facilitate coordination and consultation with other agencies with jurisdiction over the bay in the review of development and conservation proposals in the Bayland Overlay Zone.	USACE and Conservancy have coordinated with local, state, and federal agencies regarding the project.	Yes
CITY OF SAN RAFAEL GENERAL PLAN 2020		
CON-2: Wetlands Preservation. Require appropriate public and private wetlands preservation, restoration, and/or rehabilitation through compensatory mitigation in the development process for unavoidable impacts. Support and promote acquisition of fee title and/or easements from willing property owners.	All of the alternatives would implement compensatory mitigation for unavoidable impacts if applicable.	Yes
CON-5: Diked Baylands. Protect seasonal wetlands and associated upland habitat contained within undeveloped diked baylands, or restore to tidal action. Support and promote acquisition from willing property owners.	Implementation of any of the alternatives would facilitate restoration of wetland habitat.	Yes
SAN FRANCISCO BAY PLAN		
Policy 1 in Part III, Findings and Policies Concerning Fish, Other Aquatic Organisms, and Wildlife in the Bay. To assure the benefits of fish, other aquatic organisms, and wildlife for future generations, to the greatest extent feasible, the Bay's tidal marshes, tidal flats, and subtidal habitat should be conserved, restored, and increased.	Implementation of any of the alternatives would facilitate restoration of 2,600 ac of tidal wetlands habitats. Alternative 1 currently exists and has disturbed 1.5 ac of subtidal habitat. Alternatives 2 and 3 would disturb 40 ac of subtidal and intertidal habitat. Alternative 4 would disturb 123 to 243 ac of subtidal and intertidal habitat. On a relative scale of number of acres impacted per alternative, Alternative 4 is inconsistent with this policy due to the scale of disturbance.	Yes, except Alternative 4 due to the scale of disturbance relative the other alternatives.

Plan Policy	Consistency Analysis	Alternatives Consistent With Policy?
Policy 2 in Part III, Findings and Policies Concerning Fish, Other Aquatic Organisms and Wildlife in the Bay: Specific habitats that are needed to conserve, increase or prevent the extinction of any native species, species threatened or endangered, species that the California Department of Fish and Game has determined are candidates for listing as endangered or threatened under the California Endangered Species Act, or any species that provides substantial public benefits, should be protected, whether in the Bay or behind dikes.	Section 4.5 assesses the potential impacts of the alternatives on special status plants, wildlife, and fisheries in San Pablo Bay. Consultation with USFWS, NMFS, and CDFG will take place before implementation of any of the alternatives.	Yes
Policy 3 in Part III, Findings and Policies Concerning Fish, Other Aquatic Organisms and Wildlife in the Bay: In reviewing or approving habitat restoration programs the Commission should be guided by the recommendations in the Baylands Ecosystem Habitat Goals report and should, where appropriate, provide for a diversity of habitats to enhance opportunities for a variety of associated native aquatic and terrestrial plant and animal species.	Implementation of the alternatives would facilitate restoration of 2,600 ac of tidal wetlands habitats.	Yes
Policy 4 in Part III, Findings and Policies Concerning Fish, Other Aquatic Organisms and Wildlife in the Bay: The Commission should: (a) Consult with the California Department of Fish and Game and the U.S. Fish and Wildlife Service or the National Marine Fisheries Service whenever a proposed project may adversely affect an endangered or threatened plant, fish, other aquatic organism or wildlife species; (b) Not authorize projects that would result in the "taking" of any plant, fish, other aquatic organism or wildlife species listed as endangered or threatened pursuant to the state or federal endangered species acts, or the federal Marine Mammal Protection Act, or species that are candidates for listing under the California Endangered Species Act, unless the project applicant has obtained the appropriate "take" authorization from the U.S. Fish and Wildlife Service, National Marine Fisheries Service or the California Department of Fish and Game; and (c) Give appropriate consideration to the recommendations of the California Department of Fish and Game, the National Marine Fisheries Service or the United States Fish and Wildlife Service in order to avoid possible adverse effects of a proposed project on fish, other aquatic organisms and wildlife habitat.	USACE and Conservancy have coordinated with the CDFG, USFWS, and NOAA Fisheries to avoid possible adverse effects on fish, other aquatic organisms, or wildlife habitat.	Yes
Policy 5 in Part III, Findings and Policies Concerning Fish, Other Aquatic Organisms and Wildlife in the Bay: The Commission may permit a minor amount of fill or dredging in wildlife refuges, shown on the Plan Maps, necessary to enhance fish, other aquatic organisms and wildlife habitat or to provide public facilities for wildlife observation, interpretation and education.	None of the alternatives are located within a wildlife refuge, as shown on the Bay Plan maps.	Yes

Plan Policy	Consistency Analysis	Alternatives Consistent With Policy?
Policy 1 in Part III, Findings and Policies Concerning Water Quality in the Bay. Bay water pollution should be prevented to the greatest extent feasible. The Bay's tidal marshes, tidal flats, and water surface area and volume should be conserved and, whenever possible, restored and increased to protect and improve water quality. Fresh-water inflow into the Bay should be maintained at a level adequate to protect Bay resources and beneficial uses.	Section 4.4 assesses, and mitigates where necessary, potential project impacts associated with water and sediment quality. Construction and operation of any of the alternatives would not generate significant Bay pollution.	Yes
Policy 3 in Part III, Findings and Policies Concerning Water Quality in the Bay. New projects should be sited, designed, constructed and maintained to prevent or, if prevention is infeasible, to minimize the discharge of pollutants into the Bay by: (a) controlling pollutant sources at the project site; (b) using construction materials that contain nonpolluting materials; and (c) applying appropriate, accepted, and effective best management practices, especially where water dispersion is poor and near shellfish beds and other significant biotic resources.	Section 4.4 assesses, and mitigates where necessary, potential project impacts associated with water and sediment quality. Construction and operation of any of the alternatives would not generate significant pollution of the Bay.	Yes
Policy 1 in Part III, Findings and Policies Concerning Bay Water Surface Area and Volume. The surface area of the Bay and the total volume of water should be kept as large as possible in order to maximize active oxygen interchange, vigorous circulation, and effective tidal action. Filling and diking that reduce surface area and water volume should therefore be allowed only for purposes providing substantial public benefits and only if there is no reasonable alternative.	The alternatives would not reduce water surface area or volume of San Pablo Bay. Once restoration is completed by breaching the outboard levee to the HWRP and BMKV sites, San Pablo Bay would be larger than it is at present.	Yes
Policy 2 in Part III, Findings and Policies Concerning Bay Water Surface Area and Volume. Water circulation in the Bay should be maintained, and improved as much as possible. Any proposed fills, dikes, or piers should be thoroughly evaluated to determine their effects upon water circulation and then modified as necessary to improve circulation or at least to minimize any harmful effects.	Section 4.3 assesses potential project impacts associated with water circulation. Impacts for all the alternatives are less than significant.	Yes
Policy 1 in Part III, Findings and Policies Concerning Tidal Marshes and Tidal Flats around the Bay. Tidal marshes and tidal flats should be conserved to the fullest possible extent. Filling, diking, and dredging projects that would substantially harm tidal marshes or tidal flats should be allowed only for purposes that provide substantial public benefits and only if there is no feasible alternative.	Section 4.5 assesses the potential loss of mudflat and tidal salt marsh habitat. None of the alternatives would remove tidal salt marsh. Alternatives 1-3 would disturb a negligible amount (0.07 ac) of mudflat. Alternative 4 would disturb 5 to 11 ac of mudflat.	Yes, except Alternative 4 due to the scale of disturbance relative to the other alternatives.

Plan Policy	Consistency Analysis	Alternatives Consistent With Policy?
Policy 2 in Part III, Findings and Policies Concerning Tidal Marshes and Tidal Flats Around the Bay. Any proposed fill, diking, or dredging project should be thoroughly evaluated to determine the effect of the project on tidal marshes and tidal flats, and designed to minimize, and if feasible, avoid any harmful effects.	Section 4.5 assesses the potential loss of mudflat and tidal salt marsh habitat. None of the alternatives would remove tidal salt marsh. Alternatives 1–3 would disturb a negligible amount (0.07 ac) of mudflat. Alternative 4 would disturb 5 to 11 ac of mudflat.	Yes, except Alternative 4 due to the scale of disturbance relative to the other alternatives
Policy 1 in Part III, Findings and Policies Concerning Subtidal Areas in the Bay. Any proposed filling or dredging project in a subtidal area should be thoroughly evaluated to determine the local and Bay-wide effects of the project on: (a) the possible introduction or spread of invasive species; (b) tidal hydrology and sediment movement; (c) fish, other aquatic organisms, and wildlife; (d) aquatic plants; and (e) the Bay's bathymetry. Projects in subtidal areas should be designed to minimize and, if feasible, avoid any harmful effects.	Sections 4.3 and 4.5 assess, and mitigate where necessary, potential project impacts associated with the issues identified in this policy. Adverse effects are minimal in general.	Yes, except Alternative 4 due to the scale of disturbance relative to the other alternatives.
Policy 1 in Part III, Findings and Policies Concerning Dredging in the Bay. Dredging and dredged material disposal should be conducted in an environmentally and economically sound manner. Dredgers should reduce disposal in the Bay and certain waterways over time to achieve the LTMS goal of limiting in-Bay disposal volumes to a maximum of 1 million cubic yards per year. The LTMS agencies should implement a system of disposal allotments to individual dredgers to achieve this goal only if voluntary efforts are not effective in reaching the LTMS goal. In making its decision regarding disposal allocations, the Commission should confer with the LTMS agencies and consider the need for the dredging and the dredging projects, environmental impacts, regional economic impacts, efforts by the dredging community to implement and fund alternatives to in-Bay disposal, and other relevant factors. Small dredgers should be exempted from allotments, but all dredgers should comply with policies 2 through 12.	The alternatives facilitate the LTMS goal of reducing in-Bay disposal volumes through beneficial reuse.	Yes
Policy 2 in Part III, Findings and Policies Concerning Dredging in the Bay. Dredging should be authorized when the Commission can find: (a) the applicant has demonstrated that the dredging is needed to serve a water-oriented use or other important public purpose, such as navigational safety; (b) the materials to be dredged meet the water quality requirements of the San Francisco Bay RWQCB; (c) important fisheries and Bay natural resources would be protected through seasonal restrictions established by the CDFG, the USFWS, and/or the NMFS, or through other appropriate measures; (d) the siting and	The ATF alternatives involve rehandling of approved dredged materials to support tidal wetlands restoration. Construction and operation of the ATF would be in accordance with water quality, fisheries, and other environmental regulations.	Yes.

Plan Policy	Consistency Analysis	Alternatives Consistent With Policy?
design of the project will result in the minimum dredging volume necessary for the project; and (e) the materials would be disposed of in accordance with Policy 3.		
Policy 3 in Part IV, Finding and Policies Concerning Dredging in the Bay: Dredged materials should, if feasible, be reused or disposed outside the Commission's Bay and certain waterway jurisdictions. Except when reused in an approved fill project, dredged material should not be disposed in the Commission's Bay and certain waterway jurisdiction unless disposal outside these areas is infeasible and the Commission finds: (a) the volume to be disposed is consistent with applicable dredger disposal allocations and disposal site limits adopted by the Commission by regulation; (b) disposal would be at a site designated by the Commission; (c)the quality of the material disposed of is consistent with the advice of the San Francisco Bay RWQCB and the inter-agency Dredged Material Management Office (DMMO); and (d) the period of disposal is consistent with the advice of the CDFG, USFWS, and NMFS.	The alternatives facilitate the beneficial reuse of dredged materials. The HWRP and BMKV restoration projects are approved use sites and the material being placed is consistent with the advice of the RWQCB and the DMMO. USACE and Conservancy have coordinated with the CDFG, USFWS, and NMFS about the project.	Yes
Policy 5 in Part III, Findings and Policies Concerning Dredging in the Bay. To ensure adequate capacity for necessary Bay dredging projects and to protect Bay natural resources, acceptable non-tidal in-bay disposal sites should be secured and the Deep Ocean Disposal Site should be maintained. Further, dredging projects should maximize use of dredged material as a resource consistent with protecting and enhancing Bay natural resources, such as creating, enhancing, or restoring tidal and managed wetlands, creating and maintaining levees and dikes, providing cover and sealing material for sanitary landfills, and filling at approved construction sites.	The alternatives involve the rehandling of approved dredged materials to support tidal wetlands restoration.	Yes
LTMS MANAGEMENT PLAN		
The LTMS agencies will work closely with the dredging and environmental communities to implement and fund beneficial reuse projects.	Implementation of the alternatives would facilitate beneficial use of dredged material.	Yes
With the California Coastal Conservancy, BCDC and USACE will implement the Hamilton Wetlands Restoration Project. Further, the LTMS agencies will continue to participate in the Hamilton Restoration Group.	Implementation of the alternatives would facilitate restoration of tidal wetlands habitat at the HWRP site.	Yes
Where possible, proposed rehandling facilities should be located in areas that minimize loss of existing habitat or alternatively on sites located outside of the diked historic baylands with limited habitat value.	Alternatives 1-3 would be located adjacent to the existing SF-10 in-Bay disposal site, and Alternative 4 would be excavated across mudflats to the BMKV site.	Yes, except Alternative 4 due to the scale of disturbance relative to the other alternatives.

Plan Policy	Consistency Analysis	Alternatives Consistent With Policy?
During the planning stage, rehandling project proponents should, if feasible, incorporate habitat values at proposed facilities by including individual ponds that could be managed solely for habitat use or by managing the facility for habitat use during periods when dredged material is not processed. Where necessary, project proponents should provide compensatory mitigation for lost habitat functions in accordance with state and federal mitigation requirements.	All of the alternatives would implement compensatory mitigation for lost habitat function if applicable.	Yes

Section 4.9

Potential Impacts to Recreation and Commercial Fishing

4.9.1 Methodology for Impact Analysis

A qualitative approach was used to evaluate recreational and commercial fishing impacts in the open waters of San Pablo Bay for the proposed ATF and alternatives. Information from Section 4.5, *Marine and Terrestrial Biology is* referenced in relation to direct or indirect impacts of the proposed ATF and alternatives on the health and populations of relevant habitats and species that support recreation activities and commercial fishing opportunities (i.e., sedimentation to fishery reproduction, entrainment of individual fish, air quality and noise impacts of hopper dredges to hunting and their target of certain wildlife species). Existing recreation uses and commercial fishing practices are described in Section 3.9, *Recreation and Commercial Fishing*. Impacts related to subsistence fishing practices are described in Section 4.6, *Population, Housing and Environmental Justice.*

4.9.2 Impact Mechanisms

A range of impact mechanisms is considered in this analysis. The impact mechanisms were evaluated for short- and long-term effects. The most essential of the impact mechanisms and considerations include the following:

- The time of use and concentration of operation on an annual basis for the proposed ATF and alternatives.
- The number and range of boats and vessels in the immediate area. This includes both project-based vessel and non-project-based vessel traffic, and the associated changes to boater frequency and concentration. This is similar to considerations and reasoning made in Section 4.11, *Transportation and Marine Navigation*.
- Considerations of the overlap between fishing or hunting seasons (as described in the *Regional Setting* section) and the activity of the three project alternatives, namely the authorized off-loader facility operating window (April 1 to December 31) and both ATF windows (June 1 to November 30 concentration, but with the potential for year-round operations).

4.9.3 Thresholds of Significance

For the purposes of this analysis, an impact was considered to be significant and to require mitigation if it would:

- substantially change the quality of recreational resources in the vicinity of the project site;
- increase or decrease the use of existing recreational facilities such that substantial physical deterioration of the resource would occur;
- substantially change the availability of recreational resources in the vicinity of the project site;
- change the level of service that various boaters have come to expect from the immediate area;
- conflict with federal, state, and local agency regulations and policies regarding the resource.

4.9.4 Impacts and Mitigation Measures

The following table summarizes the impacts and the significance determinations for each of the alternatives, relative to Recreation and Commercial Fishing.

Table 4.9-1. Summary of Recreation and Commercial Fisheries Impacts

Impact	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact RF-1: Recreational Fishing	Less than significant	Less than significant	Less than significant	Less than significant
Impact RF-2: Recreational Hunting	Less than significant	Less than significant	Less than significant	Less than significant
Impact RF-3: Other Water-Based Recreation	Less than significant	Less than significant	Less than significant	Less than significant
Impact RF-4: Commercial Fisheries	Less than significant	Less than significant	Less than significant	Less than significant

Impact RCF-1: Substantially Adversely Affect Activities Related to Recreational Fishing

Section 4.5, *Marine and Terrestrial Biology*, outlines the changes to habitat quality and quantity of certain fish populations and individuals including potential noise and vibration effects, entrainment, degradation to water quality, shading, deposition of sediment and others. Changes to the behavior and presence of individual species of fish are unlikely to result in population-level shifts, and are therefore unlikely to result in perceptible changes in the level of recreational fishing effort invested by anglers, or the quantities of fish caught.

Alternative 1: Dredged Material Off-Loader Facility (No Action)

The physical presence of the authorized off-loader facility could reduce access to the area for recreational fishermen. However, relative to the overall size of San Pablo Bay, the approximately 2.3-ac area of the off-loader facility would be negligible in relation to access. Additionally, the only known fisheries that may overlap with the immediate vicinity of the project site are steelhead trout and white sturgeon. These two fisheries are not isolated to these locations, and would be available to fishermen in other locations around San Pablo Bay.

The window of activity around the authorized off-loader facility would be concentrated between April and December. During this time, there is could be potential for fish dispersal to occur from the site due to vessel traffic, noise and activity. Although this could improve the quality of the recreational resource at other locations around the Bay for anglers, it would need to be considered in conjunction with the open and closed seasons for particular species as mandated by CDFG. The particular species that overlap with this window are Rockfish, Cabezon, Kelp and Rock Greenling, Lingcod, other Groundfish, Ocean Salmon, White Sturgeon, Shiner Surfperch, California Halibut, Striped Bass, Soupfin Shark, and Spiny Dogfish. Considering that anglers could move to alternative fishing locations with minimal effort, this impact is considered ***less than significant***. No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Recreational access to the ATF site would generally be unrestricted, except when project-based vessel and operational activities are occurring. Perches, striped bass and sturgeon may orient to the ATF basin slopes, while white croaker and other fish may orient to disturbances caused by initial dredging of the ATF basin and/or placement and removal of dredged material from the basin. The ATF basin may have minor beneficial effects on fish through preferential habitat conditions at basin slopes or near plumes, but this benefit is not guaranteed and thus cannot be assumed. Therefore, it is not anticipated that the ATF basin will serve to increase fish densities or angling opportunities.

The "Sturgeon Triangle" is in closest proximity to the project area, and is defined by Buoy #5, the Pumphouse, and China Camp Point. Of the known fishing resources in San Pablo Bay, it would face the greatest potential for impact from the proposed action. Although larger, older individuals have been known to feed on other fish, white sturgeon are predominantly bottom-feeders of benthic invertebrates. The basin environment of the unconfined ATF could change the population of benthic invertebrates such as amphipods (including juvenile Dungeness crab), thereby changing the presence of the bottom-feeding species such as Sturgeon. The effect on the availability of prey to sturgeon over the long term will be minimal due to the presence of similar substrates in close proximity, and colonization of benthic species in the basin after disturbance. Temporary impacts could result in mortality of individual fish or benthic invertebrates. The temporary impacts identified above are unlikely to result in population-level shifts of these species, and are therefore unlikely to result in perceptible changes in the level of fishing effort invested by anglers, or the quantities of fish caught (see discussion on loss of special status fish species in Section 4.5, *Marine and Terrestrial Biology*). Additionally, even if the ATF (34 ac total) were placed entirely within the "Sturgeon Triangle" it would still only occupy a very small portion of this targeted fishing area (see Figure 3.9-1). Furthermore, Dungeness crab angling does not occur in the ATF area, but does occur in other parts of the Bay where project-related activities are absent. Finally, the restrictions on fishing access to the ATF area would not be constant, nor would they substantially reduce the area available for fishing in San Pablo Bay. Therefore, this impact is considered ***less than significant***. No mitigation is required.

Alternative 3: Confined In-Bay ATF

The area contained within the sheet piles of the proposed ATF under this alternative would not be accessible to recreational anglers. The extent of this area, however, is small: the site is 44 ac, as compared to the approximate 64,000 ac of San Pablo Bay. Even if the ATF were placed entirely within the "Sturgeon Triangle" it would still only occupy a very small portion of this targeted fishing area (see Figure 3.9-1). Impacts on recreational fishing opportunities under Alternative 3 would not differ from those described for Alternative 2. Additionally, the sheet piles could potentially create artificial habitat for certain fish and mollusk species (such as surfperches, striped bass and herring), though it is not anticipated that the ATF basin will serve to increase fish densities or angling opportunities. This impact is ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Implementation of Alternative 4 is not expected to result in a significant impact on recreational fishing. Unlike Alternatives 2 and 3, the transfer basin for Alternative 4 would be placed on the BMKV site and not in the open waters of San Pablo Bay that could interfere with existing fisheries. However, temporary impacts on fish habitat could result from the excavation and maintenance dredging for the direct channel that crosses from the vicinity of the SF-10 in-Bay disposal site to the BMKV basin. However, since implementation of Alternative 4 would not place restrictions on fishing access, and fish habitat would only be temporarily disturbed during dredging of the direct channel and vessel transit, this impact is considered ***less than significant***. No mitigation is required.

Impact RCF-2: Substantially Adversely Affect Recreational Hunting

Alternative 1: Dredged Material Off-Loader Facility (No Action), Alternative 2: Unconfined In-Bay ATF (Proposed Action), and Alternative 3: Confined In-Bay ATF

Although Alternatives 1, 2 and 3 are unlikely to have a major impact on hunting opportunities in and around San Pablo Bay, it may slightly alter the flight paths and patterns of local and migratory birds.

Replacement of the delivery pipeline could temporarily disrupt areas within about 500 feet of two duck blinds. However, the duration of disruption for replacement of the pipeline would be limited and temporary. The off-loader facility and ATF basin location are approximately 2 mi from the nearest duck blind and thus, project-related activities under these alternatives are not expected to disrupt duck hunting due to noise or visual intrusion. Therefore, because the locations of these alternatives' is at a far enough distance to the nearest duck blind such that the limited duration of construction disruption for the replacement of the delivery pipeline would not be considered an adverse effect, this impact is considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Alternative 4 will result in excavation and maintenance dredging for the direct channel that crosses from the vicinity of the SF-10 in-Bay disposal site to the BMKV basin across the western portion of San Pablo Bay. There are a number of duck blinds along the western shore, but all the blinds shown on the nautical charts, with one exception, are more than 1 mi from the direct channel. There is one duck blind about 500 feet north of the direct channel as it approaches the shoreline. Dredging of the channel could disturb waterfowl near the channel itself. However, the duration of disturbance near this one duck blind will be limited and temporary in nature; additionally, and there are ample other duck blind opportunities in San Pablo Bay and thus, this impact is considered ***less than significant***. No mitigation is required.

Impact RCF-3: Substantially Adversely Affect Other Water-Based Recreation

For larger vessels, boating impacts are discussed in Section 4.11, *Transportation and Marine Navigation*. This section discusses potential project-related effects to small craft recreation.

Alternative 1: Dredged Material Off-Loader Facility (No Action), Alternative 2: Unconfined In-Bay ATF (Proposed Action), and Alternative 3: Confined In-Bay ATF

Small-craft boating (such as jet skis and kayaks) and recreational sailing would face limited change in both quality and access. Most of the small-craft boating occurs around the periphery of San Pablo Bay, and thus at distances of a mile or greater from the off-loader and ATF sites. A change in boater conditions as a result of installation of the delivery pipeline is expected; however, the pipeline would be avoided within implementation of Mitigation Measures TMN-MM-1 and TNM-MM-2. In terms of recreational sailing, the change in area that would be available to sail would be negligible. Although sailing occurs year round, the primary sailing season and ideal winds for this recreational activity occur from May to November. Though recreational sailing occurs throughout San Francisco Bay, it is more concentrated south of the project area and towards the Golden Gate Bridge. Furthermore, much of the large vessel traffic moving through the shipping channels adjacent to the off-loader and ATF sites makes this area less appealing to sailing activity. As a result, the relative change in area available to small-craft boating users is expected to be minor. Therefore, this impact is considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Alternative 4 will have excavation and maintenance dredging for the direct channel that crosses from the vicinity of the SF-10 in-Bay disposal site to the BMKV basin across the western portion of San Pablo Bay. The portions of San Pablo Bay nearshore are not utilized heavily by recreational watercraft due to the shallow depths and risk of stranding. Dredging of the direct channel in deeper waters could disrupt small watercraft use of limited parts of San Pablo Bay. However, there are other ample areas of San Pablo Bay available for recreational use and the dredging vessel is easily avoided by recreational watercraft. Given that the duration of disturbance will be limited and temporary in nature and the availability of other recreational opportunities for small watercraft in San Pablo Bay have ample availability, this impact is considered ***less than significant***. No mitigation is required.

Impact RCF-4: Substantially Adversely Affect Commercial Fisheries

As described in Section 3.9, *Recreation and Commercial Fishing*, salmon and Pacific herring resources are the two most economically important species to commercial harvesters in the region. However, the majority of commercial salmon fishing occurs in the open ocean and Pacific herring commercial activities do not occur in San Pablo Bay. Further, although Dungeness crabs utilize San Francisco and San Pablo Bays as nursery areas during their juvenile stage, that fishery is closed in San Pablo Bay. As such, the presence and operation of a dredged material transfer facility would not likely directly impact commercial fisheries; rather, it may indirectly impact commercial fisheries in the region by disrupting other stages of these species life cycles.

Alternative 1: Dredged Material Off-Loader Facility (No Action)

The physical presence of the authorized off-loader facility would reduce access to the site for commercial fishing fleets. However, relative to the overall size of San Pablo Bay, this limitation in access would be negligible. The window of activity around the authorized off-loader facility would be concentrated between April and December. During that time, as well as during construction of the off-loader facility, it could be possible for fish to disperse from the site due to the vessel traffic, noise, and activity.

Fisheries that may be affected by the presence of the off-loader facility through an overlap in work windows and fishing seasons include salmon, rockfish, and shrimp. However, considering that commercial fleets could move to alternative fishing locations with minimal effort, this impact is considered ***less than significant***. No mitigation is required.

Alternatives 2 and Alternative 3

Similar to Alternative 1, the physical presence of Alternatives 2 and 3 would reduce access to the site for commercial fishing fleets. However, relative to the overall size of San Pablo Bay, this limitation in access would be negligible.

As described in the LTMS EIS/EIR (USACE et al. 2001), dredged material placement activities can cause temporary displacement of fish from the vicinity of the placement site, especially during high-frequency activity (whether due to cumulative water quality effects or due to the physical disturbance of placement). Placement activities at the ATF basin between December and February (outside of the work windows) could disrupt the spawning of the Pacific herring and result in mortality to eggs. Placement activities at the ATF basin could also affect the migration of steelhead and Chinook salmon. Placement and/or maintenance dredging at the ATF basin during summer could affect juvenile Dungeness crabs. Larval and juvenile fishes and invertebrates are also vulnerable to entrainment in dredging equipment. All of these could have minor impacts on the long-term viability of the commercial fisheries.

Operation of Alternatives 2 and 3 are generally not expected to displace commercial fishing fleets, but could potentially have minor indirect impacts on commercial fisheries. However, control of suspended sediment and turbidity levels as discussed in Section 4.3, *Circulation and Sedimentation*, and Section 4.5, *Marine and Terrestrial Biology*, is anticipated to mitigate potential adverse impacts on special-status and common fish species. Changes to the behavior and presence of individual species of fish are unlikely to result in population-level shifts, and are therefore unlikely to result in perceptible changes in the success of commercial fisheries. This impact is ***less than significant***. No mitigation is necessary.

Alternative 4: Direct Channel to BMKV Basin

Implementation of Alternative 4 is not expected to result in a significant impact on commercial fisheries. Unlike Alternatives 2 and 3, the transfer basin for Alternative 4 would be placed on the BMKV site and not in the open waters of San Pablo Bay that could interfere with existing fisheries. However, temporary impacts on fish habitat could result from the excavation and maintenance dredging for the direct channel that crosses from the vicinity of the SF-10 in-Bay disposal site to the BMKV basin. Since implementation of Alternative 4 would not place restrictions on commercial fishing access and fish habitat would be temporarily disturbed during dredging of the direct channel, this impact is considered ***less than significant***. No mitigation is required.

Section 4.10

Potential Impacts to Petroleum and Hazardous Materials

4.10.1 Methodology for Impact Analysis

4.10.1.1 Impact Mechanisms

Impacts to petroleum and hazardous materials were considered from those activities and resultant conditions that could release petroleum products or hazardous materials, either during construction or operation of the proposed ATF or alternatives, or by creating hazardous conditions in the project area.

4.10.2 Thresholds of Significance

For the purposes of this analysis, an impact was considered to be significant and to require mitigation if it would:

- create a significant hazard to the public or the environment through the routine transport, use, accidental release or appropriate disposal of petroleum products or hazardous materials; or
- create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of petroleum products or hazardous materials into the environment.

4.10.3 Impacts and Mitigation Measures

The following table summarizes the impacts and the significance determinations for each of the alternatives, relative to Petroleum and Hazardous Materials.

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Table 4.10-1. Summary of Petroleum Products and Hazardous Materials Impacts

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact PHM-1: Potential Public Health Hazard during Construction due to Exposure to Transport, Use, or Appropriate Disposal of Petroleum Products or Hazardous Materials	Less than Significant with Mitigation Incorporated	Less than Significant with Mitigation Incorporated	Less than Significant with Mitigation Incorporated	Less than Significant
Impact PHM-2: Potential Water and Sediment Quality Degradation due to Transport, Use, or Appropriate Disposal of Petroleum Products or Hazardous Materials during Disposal Activities	Less than Significant	Less than Significant	Less than Significant	Less than Significant

This section addresses impacts related to potential spills, upset, or release of hazardous materials from project-related equipment. Potential water quality degradation due to sediment transport, dredging, or disposal is addressed in Section 4.4, *Water and Sediment Quality*. Marine navigation and emergency response is addressed in Section 4.11, *Transportation and Marine Navigation.*

4.10.3.1 Construction Impacts

Impact PHM-1: Potential Public Health Hazard during Construction from Exposure to, or Transport, Use, or Appropriate Disposal of Petroleum Products or Hazardous Materials

Alternatives 1 through 3

Hazardous materials associated with construction equipment, including barges with cranes, dredging equipment, and other work boats, would be present on site for the duration of construction of Alternatives 1, 2, and 3. Fuel, lubricants, coolants, and other materials contained by construction equipment are considered hazardous to water resources if accidentally released due to poor equipment maintenance or an unforeseeable incident. If these materials are not managed appropriately, long-lasting impairment of water and sediment quality could result as some construction-related materials are highly mobile, persistent, and bioaccumulative in the environment.

Construction of the proposed project, including the use of barges, scows, and other equipment in the Bay waters could create a significant hazard to workers, the public, or the environment through the transport, use, or disposal of hazardous materials. Small quantities of potentially hazardous materials (such as fuel, lubricants, coolants, and other materials) would be used at the ATF basin site and transported to and from the staging areas to the basin during construction. These would include diesel fuel that could be used to power in-line booster pump facilities, lubricants, or other construction materials associated with an off-loader facility or other construction facilities. Accidental releases of small quantities of these substances due to poor maintenance of equipment could contaminate and degrade the quality of Bay waters and result in a public safety hazard.

In 2001 USACE completed an Archive Search Report for Hamilton Army Airfield (HAAF). This document identified four potential sites with firing range type of activities. One of these sites turned out to be a radar facility, while the other three were documented as a skeet range, a firing range, and a firing-in-butt. These sites were associated with small arms fire and there were no unexploded ordnance concerns. In 2002 USACE prepared a Closed, Transferring and Transferred (CTT) Range and Site Inventory for the Defense Base Closure and Realignment Act of 1988 (BRAC) property at HAAF (URS Group 2002). The CTT is a comprehensive inventory of ranges and other sites with unexploded ordnance, discarded military munitions and/or munitions constituents (UXO-DMM-MC). During this effort no UXO-DMM-MC sites were identified at HAAF. This finding is also consistent with additional records searches performed by HAAF BRAC office personnel (Keller pers. comm.).

Because of the relatively small volumes of materials on site and the limited duration of construction, the potential for release and exposure to contaminants is limited. However, in the event of a release, this impact is considered significant. As described in Chapter 2, *Description of Alternatives*, as part of the project, an Environmental Protection Plan would be developed that would include measures to address potential spill or exposure issues that may occur during construction. This would include measures for spill control, contaminant prevention, clean up, wastewater management, and other foreseeable hazards. Measures may include, but are not limited to, the following:

- inspection of equipment prior to use in-water;
- notification of spills or leaks to Office of Emergency Services or California Department of Toxic Substances Control;
- if leak is discovered, abort the use of leaking equipment and repair;
- containment of spill or leak in the water by a qualified personnel trained in spill response techniques and the Environmental Protection Plan;
- absorption or neutralization of hazardous materials (in-water).

Additionally, project construction would require permits and approvals from regulatory agencies, such as the RWQCB (see Appendix C, *Regulatory Setting*). The lead agencies' contractors would be required to comply with conditions of these permits and approvals to protect beneficial uses of water resources. Compliance with permit conditions and implementation of the Environmental Protection Plan would adequately protect against degradation of water and sediment quality due to release of construction-related pollutants. The potential impact resulting from for release of hazards in Bay waters is considered ***less than significant*** for Alternatives 1, 2, and 3.

However, potential for release of hazards related to land-side activities could be potentially significant. With, implementation of **Mitigation Measure PHM-MM-1** this impact would be considered ***less than significant*** for Alternatives 1, 2, and 3.

Mitigation Measure PHM-MM-1: Remediation of Unexploded Ordnance

If unexploded ordnance is identified during the geophysical survey conducted per Mitigation Measure CR-MM-1b (see Section 4.7, *Cultural Resources)*, USACE and Conservancy shall implement all safety and remediation actions contained within the U.S. Department of Defense Ammunition and Explosives Safety Standards (U.S. Department of Defense 2004).

Alternative 4: Direct Channel to BMKV Basin

Similar to Alternatives 1, 2 and 3, hazardous materials would be present at the project site due to construction equipment used for the excavation and construction of Alternative 4. Construction equipment used in Alternative 4 would use the same potentially hazardous materials such as fuel, lubricants, coolants, and other materials that are considered hazardous to water resources if accidentally released. As discussed above, if these materials are not properly managed, impairment of water and sediment quality could result in the long-term.

Implementation of Alternative 4 includes construction that would use both land-based equipment, such as scrapers and bulldozers used for basin levee construction, and equipment in the Bay waters, including barges and scows, that could create significant hazards to workers, the public, or the environment through the transport, use, or appropriate disposal of hazardous materials. Throughout construction, small amounts of potentially hazardous materials from the fluids contained in construction equipment would be used at the project site and transported to and from the staging areas. Accidental releases or spills of small quantities of these substances could contaminate and degrade soils and the quality of the Bay sediment and water, which would result in a public safety hazard.

Compared to Alternatives 1, 2, and 3, the potential for release and exposure of toxic substances is greater due to the expanded duration of maintenance dredging along the channel alignment. As with the other alternatives, an Environmental Protection Plan would be developed to address potential spill or exposure issues that may occur during construction of Alternative 4. In addition, project construction for Alternative 4 would require the same types of permits and approvals from regulatory agencies, as described above for Alternatives 1, 2, and 3. Compliance by the lead agencies' contractors with these permit conditions, in addition to implementation of the Environmental Protection Plan, would adequately protect against degradation of soil, sediment and water quality of the Bay due to release of construction-related pollutants. Therefore potential impacts s due to release of such hazardous materials from implementation of Alternative 4 are considered ***less than significant***. No mitigation is required.

4.10.3.2 Operational Impacts

Impact PHM-2: Potential Water and Sediment Quality Degradation due to Transport, Use, or Disposal of Hazardous Materials during Disposal Activities

Alternatives 1 through 3

Operational equipment used for dredged material disposal and subsequent transport for wetlands restoration would be similar to those used during project construction. Therefore, potential impacts on water and sediment quality due to unintentional spills of chemicals would be similar to what is discussed in Impact PHM-1 above. However, project operation would continue longer than construction and additional pathways would be available for contaminants to be introduced into the environment. Oil, diesel fuel, lubricants, or other substances used by all equipment could be leaked or spilled by scows or barges during transfer of sediments to the existing, authorized off-loader facility or ATF basin, or during reuptake of the dredged material into the transfer pipeline.

Additionally, generators at the booster pump facilities may also require lubricants and/or diesel fuel and have the potential to leak or spill these substances.

As discussed above, the lead agencies' or their contractor would implement an Environmental Protection Plan and comply with all conditions of regulatory permits for project operations. These measures would adequately minimize the potential for adverse impacts on water and sediment quality. This impact is considered ***less than significant*** for Alternatives 1, 2, and 3. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

Alternative 4 includes the operation of a 22,300-foot-long direct channel to transport dredged materials to the wetlands restoration sites. Substances such as oil, fuel, and other potentially hazardous liquids could be leaked or spilled by the transporting vessels or maintenance dredges within the channel where contaminants could be introduced into the environment at location much closer to shore. Farther distances required for dredged material transport in Alternative 4 would lead to greater opportunity for leaks and spills compared to the other three alternatives. In addition, Alternative 4 would include a small booster pump and short transfer pipeline which would require lubricants and fuel that have the potential to leak or spill on BMKV soils; however, they would be located on land where accidental spills would be more containable than spills over water.

As discussed above, the lead agencies' or their contractor would implement an Environmental Protection Plan and comply with all conditions of regulatory permits for project operations. These measures would adequately minimize the potential for adverse impacts on water and sediment quality. Therefore, this impact is considered ***less than significant*** for Alternative 4. No mitigation is required.

Section 4.11

Potential Impacts to Transportation and Marine Navigation

4.11.1 Methodology for Impact Analysis

The methodology used to evaluate focused on the following:

- potential closure of the ATF site and rerouting of shipping activity that would otherwise be located in and around the ATF site;
- unreasonable (i.e.. unplanned or regularly occurring) delays to commercial vessels plying their trade and change to the level of service; and
- increase in accidents/incidents due to violation of vessel transportation safety guidelines established for Regulated Navigational Areas (RNA) and Vessel Traffic Service (VTS).

These assumptions and considerations are typical for a traffic analysis in environmental documentation, although they have been altered slightly to fit an aquatic environment. They are also similar—if not identical—to methodologies of other aquatic projects, such as the Oakland Harbor Navigation Improvement (-50-Foot) Project (USACE and Port of Oakland, 1998).

4.11.2 Thresholds of Significance

For the purposes of this analysis, an impact was considered to be significant and to require mitigation if it would cause:

- a substantial change to the physical location (such as rerouting shipping activity) and capacity of marine navigation and transportation corridors causing unplanned or regularly occurring delays or an increase in accidents/incidents;
- a substantial adverse change in the level of service and freedom of movement that various boaters have come to expect from the immediate area; or
- the introduction of a significant hazard and safety issue to the site that would increase accidents and/or incidents.

4.11.3 Impacts and Mitigation Measures

The following table summarizes the impacts and the significance determinations for each of the alternatives, relative to Transportation and Marine Navigation.

Table 4.11-1. Summary of Transportation and Marine Navigation Impacts

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact TMN-1: Safety Hazard to Boaters and Disruption to Vessel Traffic	Less than Significant with Mitigation	Less than Significant with Mitigation	Significant and Unavoidable	Less than Significant with Mitigation
Impact TMN-2: Level of Service for Non-Project Boaters	Less than Significant with Mitigation	Less than Significant with Mitigation	Less than Significant with Mitigation	Less than Significant with Mitigation
Impact TMN-3: Roadway Traffic	Less than Significant	Less than Significant	Less than Significant	Less than Significant
Impact TMN-4: Interfere with Emergency Response Plans or Emergency Evacuation Plans	Less than Significant with Mitigation	Less than Significant with Mitigation	Less than Significant with Mitigation	Less than Significant with Mitigation

This section addresses impacts related to marine navigation, transportation hazards, and emergency response. Risk of potential spills, upset, or release of hazardous materials from project-related equipment is addressed in Section 4.10, *Petroleum and Hazardous Materials*.

Impact TMN-1: Safety Hazard to Boaters and Disruption to Vessel Traffic

Each proposed alternative and its associated infrastructure would comply with the U.S. Coast Guard's navigational standards, such as requiring some type of buoy deployment with associated night lighting to alert vessel traffic of the localized routing. While the project facilities would have proper marking to allow for safe navigation, there could still be heightened hazards and safety issues due to the interactions between fog and inclement weather, tides and currents, and project-related and non–project-related vessel traffic.

Much of the existing dredged material placement traffic to SF-9, SF-10, SF-11, and SF-16 would likely be rerouted to the proposed project while the project is in operation. This will increase the amount of vessel traffic in the immediate project vicinity—particularly between June 1 and November 30 when dredge operations are planned to be most active.

Table 4.11-2 provides an estimate of current annual average dredged material vessel trips to designated disposal sites. A substantial amount of this traffic would be diverted from its current disposal site to an off-loader, ATF basin, or BMKV basin with implementation of one of the alternatives.

Table 4.11-3 outlines the potential annual average vessel trips for transport of dredged material from various source sites around San Francisco Bay, based on Table 2-2 in Chapter 2, *Description of Alternatives*. This is displayed visually in Figure 4.11-1. This is an approximation of the material planned for placement at the HWRP restoration site. The table and figure both provide an estimate of the vessel activity that may be expected during the duration of the project.

Using the baseline data for vessel trips to dredge disposal locations shown in Table 4.11-2 , it is estimated that the number of trips to SF-10 currently average about 120 trips and the number of trips to SF-9 currently average about 100 trips for a total of 220 trips in San Pablo Bay. USACE further estimates that federal dredging projects average up to 20 trips per day during dredging episodes (USACE Annual Dredged Material Reports 1997–2005). Considering that vessel transport activity is concentrated during specific dredging episodes and it is unknown when source site dredging activities will overlap, it is reasonable to assume that the number of trips per day during the dredging work windows may exceed 20. However, the number of vessels to the project site would most likely be limited by operational considerations of safety, speed of dredged material placement, and availability of dredge and scow vessels in and around San Francisco Bay.

Alternative 1: No Action

An existing off-loader facility is currently present and operating on site, and potential maritime transportation impacts were evaluated in the Oakland Harbor Navigation Improvement (-50 Foot) Project Final EIS/EIR (USACE and Port of Oakland 1998). Current estimated trips are approximately 205 trips per year. This could increase to 550 trips per year in an average year (transfer of 1.2 mcy). The actual number of trips will be dependent upon the size of vessels used. For a maximum operational case, in which the off-loader transferred up to 1.5 mcy, trips could rise to over 700 trips per year. While the amount of trips is the lowest on an annual basis under this alternative, this traffic would extend 8 years longer than under Alternatives 2 and 3, and under 9 years longer than Alternative 4).

In accordance with U.S. Coast Guard regulations, the off-loader facility and booster pump structures, including pipeline and power cables, are properly marked and lighted at all times of the day and night to avoid being a navigational hazard to watercraft using the area. The structures are located outside of designated commercial vessel traffic lanes and away from restricted passage areas, precautionary zones, and anchorages for commercial shipping. However, all boating traffic in the vicinity of the structures need to be aware of the increased risk of activity associated with the concentration of hopper dredges, scows and tugs, and other transport vessels that would be accessing the site. The larger vessels that have regular transportation routes and coordinate with the VTS face less of an increase in risk. Small boats, however, need to pay close attention to navigation in and around the site. With the implementation of **Mitigation Measures TMN-MM-1, TMN-MM-2, and TMN-MM 3,** potential navigational safety impacts from continued use of an off-loader facility are considered ***less than significant.***

Table 4.11-2. Estimated Existing Dredged Material Vessel Trips to Designated Disposal Sites

	Dredged Material (Annual Average)		Dredge Vessel Estimated Trips (Annual Average)		
	Federal Projects (00 – 07)	Small/Medium Permitted Projects (00 – 06)	Federal Projects (00 – 07)	Small/Medium Permitted Projects (00 – 06)	Total
SF-8/OB	293,868	15,884	160	10	170
SF-9	0	159,496	0	98	98
SF-10	159,914	47,118	87	29	116
SF-11	677,945	663,293	370	409	779
SF-16	198,115		108	0	108
SF-DODS	293,782	21,001	160	13	173
GRAND TOTAL	**1,623,624**	**906,792**	**885**	**560**	**1,445**

Notes:

1. Estimated dredged material quantities based on 2000 – 2007 (federal) and 2000–2006 (permitted) dredged material placement quantities provided by DMMO reports. Annual averages shown; total in any 1 year could be higher or lower than shown.
2. Assumed transport vessels for federal projects based on assumed equipment in Table 4.11-3 by project.
3. Assumed transport vessel for permitted projects based on assumed 50/50 split between use of half-full scows (2,500 cy assumed volume per trip) and small project dredge equipment (740 cy assumed volume per trip).

Table 4.11-3. Potential Trips to Transport Dredged Material to Off-loader/ATF (Annual Average Trips)

	Vessel Type	**Alternative 1**	**Vessel Type**	**Alternatives 2 & 3**	**Vessel Type**	**Alternative 4**
FEDERAL PROJECTS						
Alameda Point Channel	S	8	S	11	S	11
Larkspur Ferry Channel	S	62	S	82	S	82
Oakland Harbor	F	49	F	66	H	103
Petaluma River Channel	H	1	H	1	H	1
Pinole Shoal/Mare Island Strait	H	32	E	62	H	42
Redwood City Harbor	H	43	H	57	H	57
Richmond Harbor	H	99	E	194	H	132
San Francisco Main Ship Channel	H	63	E	123	H	83
San Leandro Marina (Jack Maltester)	S	5	S	9	S	6
San Rafael Creek	S	7	S	9	S	9
Suisun Bay Channel	H	42	E	83	H	56
Federal Projects		410		698		584
Small /Medium Permitted Projects	S/H	148	S/H	198	S/H	*198*
GRAND TOTAL:		**558**		**895**		**781**

Notes:

1. Estimated quantities based on avg. of 1.2 mcy/year for Alternative 1 and 1.6 mcy for Alternatives 2, 3, 4 (see Table 2-3). Annual trips based on annualizing estimated trips from dredge projects. Project without annual dredging events will have higher trips during dredging year than that shown above.
2. Estimated split in material source assumes federal projects provide 80% of material and small/medium permitted projects provide 20%. Estimated split by federal projects based on 2000 – 2007 avg. annual dredged amounts in Table 2-2. Sources in any particular year will not match annual trip averages shown above.
3. Assumed transport vessel based on following assumed loads: (E) = Essayons (Hopper Dredge)—1,700 cy/load; (F) = Fully-Loaded Scow—3,900 cy/load; (H) = Half-Loaded Scow—2,500 cy/load; (S) = Small Project Dredge—740 cy/load.
4. While Alternative 1 would have fewer trips in any given year, it would have more trips than other alternatives due to its 8-year longer duration to complete.

Mitigation Measure TMN-MM-1: Follow U.S. Coast Guard Requirements.
It is expected that mariners will follow the U.S. Coast Guard–published "rules of the nautical road," which govern dredging operations in inland waterways. U.S. Coast Guard requirements include providing information on a weekly basis in the Local Notice to Mariners to captains of significant changes to the Waters of the United States. In addition, USACE and Conservancy, or their contractors, shall implement specific marking and lighting of project equipment and facilities to allow mariners to recognize the operations and take appropriate maneuvering actions. These markings will include marking surface equipment and potential subsurface hazards, such as the delivery pipeline. Acoustic aids, such as slow bells, may be added. All contractors associated with the project will be instructed to adhere to these requirements to reduce the hazard potential. This includes the appropriate levels of licensing and experience for project-based boat captains. The operators of the project will be briefed on U.S. Coast Guard's standard practices on an annual basis. The operators of the off-loader facility/ATF will periodically check the licenses of the boat captains and report any delinquent licenses to the Coast Guard.

Mitigation Measure TMN-MM-2: Coordination with the U.S. Coast Guard Vessel Traffic Service.
Depending on the size of the vessel (with 16,000 gross tons being the cutoff above which vessels are required to engage communications), USACE and Conservancy shall require that dredging projects contact VTS (1) when dredge delivery vessels commence their voyage from the excavation sites around the greater San Francisco Bay to the off-loader facility (or ATF), (2) each time a vessel leaves the off-loader facility (or ATF) and returns to the open water and (3) in the event that project vessels are likely to restrict or affect navigation of other vessels. This will limit the hazard faced by non-project boaters such as oil tankers and ferries. Project-based boats and their captains will continue to monitor the VHF-FM Channel 13 VTS communication channel to keep abreast of other vessel movements and potential navigational hazards. Non-project boats and their captains can monitor the communication channel to minimize their risk, as well as receive notification of the current conditions and operations in and around the project site. The standard practice is for the reporting to the VTS to be incorporated into the Harbor Safety Committee's accounting and recording system. It is standard practice for the Harbor Safety Committee to report the information on a monthly basis.

Mitigation Measure TMN-MM-3: Channel Navigation and Maneuverability.
At all times, USACE and Conservancy shall require that all vessels and their captains associated with the operations of the off-loader facility (or ATF) will confine their movements to marked navigation channels to the maximum extent possible. These vessels, including their towing bridles, shall be in good working order, and maintained at such a level to ensure the maximum possible maneuverability associated with their particular vessel type. This caveat distinguishes between dredge hoppers and tugs with barges, the latter of which are inherently less maneuverable than the former. The operators of the project will periodically review the ship's log of the vessels to check their maintenance records. Furthermore, the operators who are at the project site will visually inspect the conditions of the boats for signs of disrepair and dramatic decay.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Alternative 2 would create an increase in vessel traffic and congestion in and around the project site. As discussed above, it is estimated that the number of trips to SF-10 currently average about 120 trips and to SF-9 currently average about 100 trips, for a total of 220 trips in San Pablo Bay. With Alternative 2, annual average trips would increase to nearly 900 trips per year for an average year (1.6 mcy transferred). For a maximum case, in which the ATF transferred up to 3.6 mcy, trips could rise to just over 2,000 trips per year.

Note: Trips based on Table 4.11-3 which is based on 2000 – 2007 average dredge material from federal projects and assumed equipment. Figure does not show location or trips from medium and small permitted projects which will likely also utilize the proposed ATF and would also contribute trips. Total vessel trips would be higher overall with Alternative 1 (but lower annually) and would be similar with Alternative 4 (but slightly less).

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Figure 4.11-1
Potential Dredge Disposal Vessel Traffic from Federal Projects (Alternatives 2 or 3)

This alternative would have a booster-pump structure and pipeline as in Alternatives 1 and 3, as well as a hydraulic dredge and support vessels moving around the 34-ac site. Alternative 2 could be a risk to boaters and a disruption of vessel traffic due to the periodic nature and intensity of project operations. All boats would need to be aware of the increased risk of activity associated with the concentration of hopper dredges, scows, and tugs, and other transport vessels that would be accessing the site. Finally, although the majority of the 28,000-foot transfer pipeline would be submerged, thereby avoiding most vessel traffic in San Pablo Bay, it may create a safety hazard for boats with shallow drafts that travel into shallow waters (only small boats with shallow drafts venture in the western San Pablo Bay waters west of the Petaluma channel).

With the implementation of the previously described **Mitigation Measures TMN-MM-1, TMN-MM- 2,** and **TMN-MM-3** above, as well as **Mitigation Measure TMN-MM-4** below, potential impacts are considered ***less than significant***.

Mitigation Measure TMN-MM-4: Plans and Practices within the Proposed ATF. To improve the coordination and management of vessel traffic and to reduce risk to non-project and project-based vessels, a comprehensive plan shall be developed which will apply to all project-based vessels within the boundaries of the ATF. The comprehensive plan shall include:

- Vessel Traffic Information System (VTIS). This will be distinct from the U.S. Coast Guard's VTS, and will be meant to direct traffic in, out, and around the facilities. Conducted by an onsite manager, it will require visual oversight of vessels, and verbal communication between vessels and the VTIS manager.
- Marine Operations Plan (MOP). The MOP will address weather and known navigational hazards and their potential influence on the safety of ATF operations and vessel traffic. In advance of project inception, it will identify and document the ATF users' specific navigation requirements such as draft, navigational aids, docking and mooring requirements, mobility, and clearances.
- Reporting to the VTIS will be provided to the Harbor Safety Committee on a monthly basis by the project operators. The method and tracking mechanisms will have to be defined and codified to ensure compliance with and utility to the existing VTS information system. The Harbor Safety Committee will then choose whether to broadcast it to the public through their website. In a coordinated fashion, the MOP will be developed with vessel owners and operators. Once codified, the MOP will be provided by the ATF operators via electronic distribution to the vessel owners and operators that are anticipated to use the site as well as to the US Coast Guard for inclusion in the Local Notice to Mariners.

Alternative 3: Confined In-Bay ATF

Alternative 3 would result in the same number of vessel trips as discussed above for Alternative 2.

In addition, with Alternative 3, the piers and sheetpile that protrude from the water could cause a restriction for vessel traffic in the project area. However, ferry traffic and commercial traffic utilize the shipping channels and do not travel through the area where the sheetpile would be placed. Recreational users generally operate smaller boats that have more maneuverability to get around the project area, and are also not generally on a regular schedule. It is not anticipated that Alternative 3 could pose a navigational hazard to non-project vessels that move outside of the shipping channels. This situation is most likely to occur in inclement weather when visibility is reduced and high seas may increase the difficulty of vessel steering. This situation may also occur if vessels experience mechanical failures and the captain loses control of the vessel. The sheetpile wall would be a solid, immovable object into which boats moving out of the shipping channel could crash. Each of these situations would be exacerbated in the case that a vessel captain lacked experience, training, or was otherwise impaired. Although large vessel movements (over 16,000 gross tons) within RNAs are limited to slower than 15 knots, the worst-case scenario would be that a large oil tanker or cargo vessel may crash into the confinement walls. Such a collision could damage both the ATF confinement wall and the tanker or cargo vessel and possibly cause oil or cargo to spill into San Pablo Bay. In the rare and unlikely event of a major oil spill as a result of a collision with the ATF, there would be significant and unavoidable impacts to San Pablo Bay, the greater San Francisco Bay, and coastal areas.

In terms of the project-based boats, the greatest increase in safety hazards would be to the hopper dredges, tugs, barges, and scows inside the perimeter of the sheetwall as they conduct routine operations. These vessels would need to carefully maneuver within the sheetpile area to avoid collisions.

Additionally, although the majority of the 28,000-foot transfer pipeline would be submerged, it may create a safety hazard for smaller draft boats that travel into the shallow waters of San Pablo Bay.

Under normal circumstances (i.e., good weather and visibility, proper function of vessels) the implementation of **Mitigation Measures TMN-MM-1**, **TMN-MM-2**, **TMN-MM-3,** and **TMN-MM-4,** would reduce the likelihood of a collision. However, under inclement weather conditions or if vessels not confined to the primary/secondary shipping channel leave those shipping channels, implementation of these mitigation measures would likely not be sufficient; therefore, this impact remains ***significant and unavoidable***.

Alternative 4: Direct Channel to BMKV Basin

Alternative 4 would create an increase in vessel traffic and congestion in and around the project site. As discussed above, it is estimated that the number of trips to SF-10 currently average about 120 trips and to SF-9 currently average about 100 trips, for a total of 220 trips in San Pablo Bay. With Alternative 4, annual average trips would increase to nearly 800 trips per year for an average year (1.6 mcy transferred). For a maximum case, in which the ATF transferred up to 3.6 mcy, trips could rise to just over 1,750 trips per year.

For Alternative 4, the delivery of dredged material would be accomplished via a 6.1-mi-long direct channel to the BMKV site. Use of the direct channel may pose a lesser safety risk to project-related navigation because the direct channel would streamline vessel traffic directly to the BMKV basin where access to the site would be controlled. However, potential hazards to transportation and navigation along the direct channel still exist. Potential hazards could occur around the mouth of the single-lane direct channel, particularly if transport vessels began queuing in San Pablo Bay. As with Alternatives 2 and 3, during the six months of peak activity, all boating would face a navigational hazard risk in this area due to the increase of project-related traffic. Another potential hazard arises from the delivery of dredged material within the channel. Due to channel depth, project-related vessels must not exceed a draft of 12 feet. Accidental overloading could cause a hazard by potential scraping or grounding of a vessel within the channel. Finally, improper maneuvering within the narrow single-lane channel could also cause scraping or grounding of a vessel along the channel slope.

With implementation of the previously described **Mitigation Measures TMN-MM-1, TMN-MM-2, TMN-MM-3,** and **TMN-MM-4** these impacts are considered ***less than significant.***

Impact TMN-2: Level of Service for Non-Project Boaters

This impact focuses on non-project vessels that are large and are confined to deep-water channels associated with the primary and secondary shipping channels. The potential location for the proposed project and alternatives does not directly interfere with major shipping channels. However, the primary interruption of service for non-project vessels would be associated with the potential conflict with dredged material transport vessels moving to and from the project site. Across all alternatives, this impact would be significant; however, with but the implementation of **Mitigation Measures TMN-MM-1** and **TMN-MM-2,** will render this impact is considered ***less than significant*** for the large vessel classes.

For the smaller vessel classes not confined to the primary and secondary shipping channels, the associated impacts to their level of service need to be considered alternative by alternative.

Alternative 1: No Action

The off-loader facility, supporting booster-pump structure, pipeline, and power cable are currently in place and operational. Although small vessels must currently maneuver around these structures, this has not been an impediment to their access and use of San Pablo Bay. With implementation of **Mitigation Measures TMN-MM-1** and **TMN-MM-2** potential navigation hazards for non-project boaters would be further minimized: therefore, this impact is considered ***less than significant***.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

For small vessels, the presence of Alternative 2 in San Pablo Bay would not create an obstruction to navigation routes. Similar to Alternative 1, the open water of the unconfined in-Bay ATF would not limit a small vessel's access to or use of San Pablo Bay. They would be affected, however, by the project-related transport vessels coming to and from the site and the periodic dredging activity within the basin site. The area of limited service would be about 35 ac and would vary depending on the time of day and month of the year. Considering the overall size of San Pablo Bay and the likelihood of small vessel traffic around the Bay's periphery, this restriction would be no more intrusive than the off-loader facility. As with Alternative 1, implementation of **Mitigation Measures TMN-MM-1** and **TMN-MM-2** would further reduce navigation hazards for non-project boaters. This impact is considered ***less than significant***.

Alternative 3: Confined In-Bay ATF

For small vessels, the presence of Alternative 3 in San Pablo Bay could create an obstruction to navigation routes. It would create a solid immovable object into which boats could crash. This structure would be substantially larger than the authorized off-loader facility in Alternative 1. Furthermore, vessels could be affected by project-related transport vessels coming to and from the site. The area that would be inaccessible to non-project vessels would be about 35 ac. Considering the overall size of San Pablo Bay and the relative size of the physical structure, this restriction would be of minimal importance; however, it would have the greatest impact of any of the four alternatives on the level of service. This impact would be potentially significant. With implementation of **Mitigation Measures TMN-MM-1** and **TMN-MM- 2** potential navigation hazards for non-project boaters would be minimized; therefore, this impact is considered ***less than significant***.

Alternative 4: Direct Channel to BMKV Basin

For small vessels, the presence of Alternative 4 in San Pablo Bay would create a concentration of large material transport vessels across a shallow bay panne that has not historically hosted scows and barges. This channel would encompass 119–233 ac of subtidal/shallow bay and stretch out over

22,300 feet across San Pablo Bay. Small vessels would be allowed within the direct channel and could create navigational safety hazards for and with project-related transport vessels traveling inside the channel. Large dredged material transport vessels cannot turn or stop quickly, particularly given the confines of the direct channel, and so small vessels would have to take care in navigating within or across the direct channel. With implementation of **Mitigation Measures TMN-MM-1** through **TMN-MM-4** impacts on potential navigation hazards for non-project boaters are considered ***less than significant***.

Impact TMN-3: Roadway Traffic

All Alternatives

There will be no direct impact under any alternative on the roadway network because the project is located within the confines of San Pablo Bay and the adjacent restoration parcels. Indirect impacts may be associated with transportation required to support workers, but these impacts were analyzed in the prior EIS/EIRs for the HWRP and BMKV and are not the subject of this document. Due to the location and nature of the project, impacts to the regional terrestrial transportation system would be ***less than significant*** under all four alternatives. No mitigation is required.

Impact TMN-4: Interfere with Emergency Response Plans or Emergency Evacuation Plans

This impact focuses on the emergency response of non-project activities, boats, aircraft, and other machines employed by the emergency response providers such as the U.S. Coast Guard.

Alternative 1: No Action

As described above, all boating traffic in the vicinity of the structures needs to be aware of the increased risk of activity associated with the concentration of hopper dredges, scows, and tugs, and other transport vessels that are accessing the site. Implementation of Mitigation Measures **TMN-MM-1**, **TMN-MM-2**, and **TMN-MM-3** above would ensure that the project operator conducts orderly and controlled navigation, and coordinates communication during emergencies with the relevant overseeing and regulatory bodies. This impact is considered ***less than significant***. No further mitigation is required to address emergency response for Alternative 1.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

As described above, Alternative 2 would create an increase in vessel traffic and congestion in and around the project area. This would arise from both the delivery of dredged material to the ATF basin and the excavation and delivery of dredged material to the restoration site. Implementation of **Mitigation Measures TMN-MM-1** through **TMN-MM- 4** above would ensure that the project operator conducts orderly and controlled navigation, and coordinates communication during emergencies with the relevant overseeing and regulatory bodies. This impact is considered ***less than significant***. No further mitigation is required to address emergency response for Alternative 2.

Alternative 3: Confined In-Bay ATF

For Alternative 3, the greatest hazard would be in circumstances where emergency response is needed to the dredge hoppers, tug, barges, and/or scows inside the perimeter of the sheetwall as they conduct routine operations. The sheetpile confinement may create some difficulty, particularly if the confined ATF were at full capacity, in accessing and responding to emergency situations within desired response times. However, implementation of Mitigation Measures **TMN-MM-1** through **TMN-MM-4** above would ensure that the project operator conducts orderly and controlled navigation, and coordinates communication during emergencies with the relevant overseeing and regulatory bodies. This impact is considered ***less than significant***. No further mitigation is required to address emergency response for Alternative 3.

Alternative 4: Direct Channel to BMKV Basin

For Alternative 4, the greatest increase in hazards would be at the mouth and inside the direct channel during delivery of dredged material to the restoration site. However, implementation of Mitigation Measures **TMN-MM-1** through **TMN-MM-4** above would ensure that the project operator conducts orderly and controlled navigation, and coordinates communication during emergencies with the relevant overseeing and regulatory bodies. This impact is considered ***less than significant***. No further mitigation is required to address emergency response for Alternative 3.

Section 4.12
Potential Impacts to Air Quality

4.12.1 Methodology for Impact Analysis

The proposed ATF would have distinct periods of short-term construction and long-term operations activities and associated impacts. Short-term construction activities associated with the proposed action include transport of construction materials to the project site, pile driving, and initial dredging activities to construct an off-loader, excavate the proposed ATF basin and access channel (and driving sheet pile in one alternative, or excavation of a BMKV basin and a direct channel. Long-term operations of an off-loader, an ATF, or the BMKV basin are still considered construction activities of the HWRP. Long-term ATF operations include on-going placement of dredged material, re-dredging the ATF basin, and the transfer of the dredged material to the restoration site. The transfer of dredged materials to the HWRP site under the proposed action or alternative is expected to be completed within 9 to 18 years, depending on the alternative. Air quality background data and estimated emissions calculations are presented in Appendix F of this document.

Impact associated with greenhouse gas emissions are addressed separately in Section 4.15, *Greenhouse Gas Emissions and Climate Change*.

4.12.1.1 Baseline Emissions

Baseline emissions were calculated to determine emissions associated with the No Action Alternative (Alternative 1 – Off-loader Facility). Comparing emissions from each proposed alternative to baseline emissions would determine overall net change in emissions associated with implementation of the action. The baseline condition for this project is the use of a diesel-powered off-loader facility during transfer of dredged materials from the transportation vessel to the restoration sites. Although Alternative 1 could be implemented with either a diesel- or electrically powered off-loader, using the diesel-powered off-loader as the baseline represents maximum emissions conditions. The baseline is presented for both construction and operation activities.

The existing off-loader is operated in a manner not to exceed *de minimis* conformity thresholds of criteria pollutants. Similarly, as discussed in Chapter 2, *Description of Alternatives*, an off-loader associated with this project would also be operated not to exceed *de minimis* conformity thresholds of criteria pollutants.

4.12.1.2 Criteria Pollutant Emissions

Emissions were estimated for four criteria pollutants: the ozone precursors reactive organic gases/ volatile organic compounds (ROG/VOC) and nitrogen oxides (NO_X); carbon monoxide (CO); and fugitive dust and particulate matter (PM_{10}) (see Appendix F). Because fine particulate matter ($PM_{2.5}$) emissions are a subset of PM_{10}, a separate evaluation was not completed. The impacts from each alternative were determined by comparing the estimated emissions for each alternative to the baseline. As with the baseline, the emissions estimates presented herein represented emissions from uncontrolled diesel engines for an "apples to apples" comparison of the emissions that could be generated by each alternative.

It is currently unknown precisely which pieces of equipment will be used for the construction and operation of each alternative. Consequently, several assumptions on equipment size (horsepower), year of manufacture, and hours of operation were made to estimate the emissions of each alternative (See Appendix F). The emission factors that were used for each of the criteria pollutants are consistent with EPA's Tier 1 standards for new off-road diesel engines manufactured from 1996 to 2000 (EPA 1997).

Criteria pollutant emissions estimates formed the basis for the General Conformity Applicability Analysis for the proposed action. The conformity analysis is provided as Appendix G of this document.

Criteria pollutant emissions from the transportation of dredged material to the proposed action and its alternatives were qualitatively analyzed. Quantitative analysis of criteria pollutant emissions from the transportation for dredged material will be evaluated by the dredging project proponents that using HWRP as a placement site.

4.12.1.3 Toxic Air Contaminant Emissions

Potential toxic air contaminant (TAC) emissions were evaluated by conducting a screening-level analysis. The screening-level analysis consists of reviewing the project description and site plan to identify any new or modified TAC emissions sources. The TAC emissions evaluation determined that the proposed action would not introduce a new source or modify an existing TAC emissions source requiring a more detailed analysis (i.e., dispersion modeling).

4.12.1.4 Odor Emissions

Potential odor emissions impacts were also evaluated by conducting a screening-level analysis. The analysis determined that odor emissions impacts would not require dispersion modeling.

4.12.2 Thresholds of Significance

For the purposes of this analysis, an impact was considered to be significant and to require mitigation if it would:

- Conflict with or obstruct implementation of applicable air quality management plans.
- Violate air quality standards or contribute substantially to existing, or projected, air quality violations pursuant to the Federal Clean Air Act (CAA) and California Clean Air Act (CCAA).
- Result in a 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 the release of emissions that exceed quantitative thresholds for criteria pollutants (Table 14.2-1).
- Expose sensitive receptors to substantial pollutant concentrations.
- Create objectionable odors affecting a substantial number of people.

Table 4.12-1 presents criteria pollutant emissions standards under the federal *de minimis* thresholds and the BAAQMD's adopted CEQA thresholds of significance. Emissions limits are provided for the following criteria pollutants ROG/VOC, NO_X, CO, and PM_{10} (inclusive of $PM_{2.5}$).

The thresholds in Table 4.12-1 for CEQA are for operational emissions. There are no thresholds of significance established by BAAQMD, under CEQA, for construction activities. Operation of the unconfined ATF, or the action alternatives is considered a construction component of the HWRP project. The ATF will cease operations when construction of the wetland restoration project is complete. Therefore, there are no applicable, quantitative thresholds of significance for the emissions of criteria pollutants under CEQA.

Under the General Conformity rule [40 CFR 93.153(b)(1)], federal thresholds are 100 tons of ROG/VOC, NO_X, and CO. These thresholds apply to both construction and operation emissions and thus apply to this project.

Table 4.12-1. Federal and State Regional Mass Emission Standards (tons per year)

Criteria Pollutant	Federal *de minimis* threshold (tons/year)	CEQA threshold of significance (tons/year)
ROG/VOC	100	15
NO_X	100	15
CO	100	--
PM_{10}	--	15
Sources: 40 CFR 93.153(b)(1); BAAQMD 1999		

4.12.3 Impacts and Mitigation Measures

Table 4.12-2 summarizes the impacts and the significance determinations for each of the alternatives, relative to Air Quality.

Table 4.12-2. Summary of Air Quality Impacts

Impacts	Alternative 1: Dredged Material Off-loader facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact AQ-1a: Project-related Criteria Pollutant Emissions: Construction Emissions	Less than Significant	Less than Significant	Less than Significant	Less than Significant
Impact AQ-1b: Project-related Criteria Pollutant Emissions: Operations Emissions	Less than Significant	Less than Significant	Less than Significant	Less than Significant
Impact AQ-1c: Project-related Criteria Pollutant Emissions: Transportation Emissions	Less than Significant	Beneficial	Beneficial	Beneficial
Impact AQ-2: Compliance with General Conformity Requirements	Less than Significant	Less than Significant	Less than Significant	Less than Significant
Impact AQ-3: Project-related Toxic Air Contaminant Emissions	Less than Significant	Less than Significant	Less than Significant	Less than Significant
Impact AQ-4: Project-related Odor Emissions	Less than Significant	Less than Significant	Less than Significant	Less than Significant

Impact AQ-1—Project-related Criteria Pollutant Emissions

Criteria pollutant emissions from the proposed action or alternatives would be generated by diesel-powered engines, such as: engines, pumps, and generators on the booster pump station(s) and off-loader or dredge. Emissions from activities that are related to, but not part of the proposed action include: on-shore restoration activities and wind-generated fugitive dust at the on-shore restoration site. These related emissions are evaluated in the HWRP EIS/EIR (USACE 1998) and the BMKV SEIS/EIR (USACE 2003) and presented in summary in this document. The detailed methodology and data used to estimate emissions under the proposed action is presented in Appendix F of this document.

Impact AQ-1a: Construction Emissions

This section discusses emissions generated for construction activities of each alternative. Related emissions-generating activities that would be concurrent with construction of all alternatives include: operation of the existing, electrically powered authorized off-loader facility, dredged material transfer from the authorized off-loader to the restoration site and on-shore restoration activities. Table 4.12-3 presents a summary for criteria pollutant emissions that would be generated during the construction of each alternative.

Table 4.12-3. Summary of Uncontrolled Criteria Pollutant Emissions (tons) from Construction of Each Alternative

Component	Sediment Volume (cy)	ROG	NO_x	CO	PM_{10}
Alternative 1. Dredged Material Off-loader (Baseline)					
Total Emissions		**8.8**	**65.6**	**17.7**	**2.3**
Construction of replacement off-loader					
Installation of Piles for Platform (pile driving)		*2.3*	*13.5*	*6.0*	*0.8*
Installation of Off-loader		*0.9*	*5.0*	*2.2*	*0.3*
Installation of transfer pipeline and power cable		*1.6*	*9.5*	*4.3*	*0.5*
Existing Off-loader operations during construction		0.2	1.3	0.6	0.1
Decommissioning of Existing Off-loader		1.9	10.8	4.7	0.6
Average Annual Restoration Activities (HWRP)		1.8	25.4		
Alternative 2. Unconfined In-Bay ATF (Proposed Action)					
Total Emissions		**34.6**	**213.9**	**81.9**	**11.0**
Construction of ATF					
Dredging of ATF Basin + Access Channel	*1,811,000*	*28.9*	*166.1*	*72.2*	*9.6*
Installation of infrastructure, pipeline and power cable		*1.8*	*10.2*	*4.4*	*0.6*
Existing Off-loader operations during construction		0.2	1.3	0.6	0.1
Decommissioning of Existing Off-loader		1.9	10.8	4.7	0.6
Restoration activities (HWRP)		1.8	25.4		
Alternative 3. Confined In-Bay ATF (Proposed Action)					
Total Emissions		**35.8**	**220.9**	**85.0**	**11.4**
Construction of ATF					
Dredging of ATF Basin	*1,811,000*	*28.9*	*166.1*	*72.2*	*9.6*
Installation of sheet piles		*2.2*	*12.9*	*5.6*	*0.7*
Installation of pipeline and power cable		*0.8*	*4.4*	*1.9*	*0.3*
Existing Off-loader operations during construction		0.2	1.3	0.6	0.1
Decommissioning of Existing Off-loader		1.9	10.8	4.7	0.6
Restoration activities (HWRP)		1.8	25.4		
Alternative 4. Direct Channel to BMKV-Basin					
Total Emissions		**67.9**	**426.6**	**158.1**	**20.0**
Construction of ATF					
Initial excavation of basin	*1,260,300*	*24.7*	*159.0*	*55.0*	*6.2*
Dredging of access channel and basin	*2,412,400*	*39.1*	*229.0*	*97.3*	*13.0*
Installation of transfer pipeline and power cable		*0.1*	*1.1*	*0.5*	*0.1*
Existing Off-loader operations during construction		0.2	1.3	0.6	0.1
Decommissioning of Existing Off-loader		1.9	10.8	4.7	0.6
Restoration activities (HWRP)		1.8	25.4		

Alternative 1: No-Action

Emissions-generating construction activities, if needed, for Alternative 1 include: pile driving for the off-loader platform, mobilization and installation of the off-loader facility at the project site, replacement of the dredged material transfer pipeline, and the installation of electrical infrastructure. Criteria pollutant emissions were estimated for the construction of Alternative 1 with uncontrolled, diesel-powered equipment and are presented in Table 4.12-3. The estimated emissions for Alternative 1 serve as the baseline emissions for ATF construction activities.

To ensure that a worst-case scenario is disclosed, construction emissions were calculated with the assumption that the existing authorized off-loader facility that is currently in-use will need to be replaced in its entirety, as discussed in Chapter 2. If part, or all, of the authorized off-loading facilities component remain on-site, the emissions for construction of Alternative 1 will be less than those estimated under the worst-case scenario. Criteria pollutant emissions that would be generated by the construction of Alternative 1 are below federal *de minimis* thresholds, therefore, these impacts are considered ***less than significant.*** No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Emissions-generating construction activities for Alternative 2 include: excavation of the ATF basin and access channel, installation of the dredged material transfer pipeline, and the installation of electrical infrastructure. Related activities that would generate emissions and be concurrent with the ATF construction include: operation of the existing, electrically powered off-loader; dredged material transport from the off-loader to the restoration site; and on-shore restoration activities. Criteria pollutant emissions were estimated for the construction of Alternative 2 under the assumption that only uncontrolled diesel-powered equipment would be used to represent the worst-case scenario.

Results of the uncontrolled emissions analysis for Alternative 2 are presented in Table 4.12-3. Uncontrolled diesel emissions from construction activities under Alternative 2, including the dredging and transfer of approximately 1.8 mcy of sediment, would exceed baseline emissions. Uncontrolled emissions associated with the construction of Alternative 2 would also exceed federal *de minimis* thresholds for $NO_{X\ if}$ construction of the ATF is completed within one calendar year and/or emission control measures were not implemented.

Emissions controls are included as part of the project. As described in Chapter 2, *Description of Alternatives*, these controls include monitoring, three options for marine diesel emissions control; and onshore fleet modernization requirements for construction equipment:

- Monitoring – Evaluation of emissions estimates will be prepared annually based on the specific project related activities that are scheduled and monitoring of equipment activity will be conducted to ensure that total project emissions do not exceed the *de minimis* annual thresholds.
- Control Option A: One control option is to schedule project activities so that annual emissions will not exceed the *de minimis* threshold.
- Control Option B: A second control option is to apply appropriated diesel emission control strategies that have been verified by the California Air Resources Board[1] (ARB) to reduce PM_{10} and NO_X emissions generated from construction or operations of the ATF basin. These technologies include, but are not limited to, selective catalytic reduction (SCR), exhaust gas recirculation and use of alternative fuels. The most likely verified emissions control strategy to be applied to the dredging equipment is SCR.
- Control Option C: The third option is to electrify all dredging equipment and booster pump(s) that will be used for constructing and operating the ATF.
- Fleet Modernization for Equipment at HWRP – Construction equipment will be required to meet Tier 2 nonroad standards, apply ARB –certified Best Available Control

technology (BACT) and other requirements as necessary to ensure, with other strategies noted above, that annual emissions are less than the *de minimis* thresholds.

The resultant emissions with application of the emissions controls are shown in Table 4.12-4.

Table 4.12-4. Controlled Emissions from the Construction of the Unconfined ATF in-Bay Basin (in tons per year)

Component	ROG	NOX	CO	PM10
Construction of ATF	30.7	62.2	76.7	10.2
Dredging of ATF Basin + Access Channel	*28.9*	*<52.0*[c]	*72.2*	*9.6*
Installation of infrastructure, pipeline and power cable	*1.8*	*10.2*	*4.4*	*0.6*
Existing Off-loader operations during construction	0.2	1.3	0.6	0.1
Decommissioning of Existing Off-loader	1.9	10.8	4.7	0.6
Restoration activities (HWRP)	1.8	25.4		
Total Emissions	34.6	99.7	81.9	11.0

Emission control measures, described in Chapter 2, will be implemented to ensure that the ATF operations are below the stated quantity and that total project emissions will *de minimis.*

With implementation of the emissions controls as part of the proposed action, potential emissions of criteria pollutants would be to less than the *de minimis;* therefore and impacts from construction emissions are considered ***less than significant***.

Alternative 3: Confined In-Bay ATF

Emissions-generating construction activities for Alternative 3 include: excavation of the ATF basin, installation of sheet pile enclosure, installation of the dredged material transfer pipeline, and the installation of electrical infrastructure. Related activities that would generate emissions and be concurrent with ATF construction include: operation of the existing, electrically powered off-loader; dredged material transport from the off-loader to the restoration site; and on-shore restoration activities. Criteria pollutant emissions were estimated for the construction of Alternative 3 under the assumption that only uncontrolled diesel-powered equipment would be used to represent the worst-case scenario.

Results of the uncontrolled emissions analysis for Alternative 3 are presented in Table 4.12-3. Emissions from construction activities under Alternative 3 would exceed baseline emissions. Construction of Alternative 3 would also exceed *de minimis* thresholds for NO_X if construction of the ATF is completed within one calendar year and/or emission control measures were not implemented.

As shown in Table 4.12-4, with controls, construction emissions would be less than the *de minimis* thresholds for Alternative 2. Similarly, application of controls for Alternative 3 would also limit construction emissions.

With implementation of the emissions controls as part of the proposed action, potential emissions of criteria pollutants would be to less than the *de minimis;* therefore and impacts from construction emissions are considered ***less than significant***.

Alternative 4: Direct Channel to BMKV-Basin

Emissions-generating construction activities for Alternative 4 include: excavation of the ATF basin, excavation of an access channel, and the installation of electrical infrastructure. Related activities that would generate emissions and be concurrent with ATF construction include: operation of the existing, electrically powered off-loader; dredged material transport from the off-loader to the restoration site; and on-shore restoration activities. Criteria pollutant emissions were estimated for the construction of Alternative 4 under the assumption that only uncontrolled diesel-powered equipment would be used to represent the worst-case scenario.

Results of the emissions analysis for Alternative 4 are presented in Table 4.12-3. Uncontrolled emissions from construction activities under Alternative 4 would exceed baseline emissions. Uncontrolled emissions from construction of Alternative 4 would also exceed *de minimis* thresholds for NO_X if construction of the ATF is completed within one calendar year and/or emission control measures were not implemented.

As shown in Table 4.12-4, with controls, construction emissions would be less than the *de minimis* thresholds for Alternative 2. Similarly, application of controls for Alternative 4 would also limit construction emissions.

With implementation of the emissions controls as part of the proposed action, potential emissions of criteria pollutants would be to less than the *de minimis;* therefore and impacts from construction emissions are considered ***less than significant***.

Impact AQ-1b: Operations Emissions

As previously stated, the operation of the proposed action, or its alternatives, is considered a construction component of the HWRP. The proposed action or its alternative will cease operations when construction of the wetland restoration project is complete. Table 4.12-5 presents a summary for criteria pollutant emissions that would be generated during the operation of each alternative. On-shore restoration activities would also continue for the duration of each alternative and annual emissions from on-shore activities were assumed to be constant (1.8 tons ROG/VOC and 25.4 tons NO_X) for the operational life of the off-loader.

Table 4.12-5. Summary of the Uncontrolled Criteria Pollutant Emissions (tons) from Projected Annual Operations of each Alternative.

	Sediment volume (cy)	ROG (tons)	NO_x (tons)	CO (tons)	PM_{10} (tons)
Alternative 1. Dredged Material Off-loader (Baseline)					
Average Annual Operations	1,200,000	17.1	98.6	42.9	5.8
Maximum Annual Operations	1,500,000	21.4	123.2	53.6	7.3
Project Life (about 15–18 yrs)	22,000,000	314.3	1807.0	785.6	106.7
Alternative 2. Unconfined In-Bay ATF (Proposed Action) and Alternative 3. Confined In-Bay ATF					
Average Annual Operations	2,018,000	19.4	111.7	48.6	6.5
Maximum Annual Operations	4,025,000	38.2	219.9	95.6	12.7
Project Life (about 10 years)	20,189,000	191.5	1,101.1	478.8	63.8
Alternative 4. Direct Channel to BMKV					
Average Annual Operations	2,036,000	19.4	111.7	48.6	6.5
Maximum Annual Operations	4,025,000	38.2	219.9	95.6	12.7
Project Life (about 9 years)	18,327,300	173.9	999.9	434.8	58.0

Annual operations emissions do not include on-going restoration activities at the HWRP

Alternative 1: No-Action

Emissions-generating activities during operation of Alternative 1 include: off-loading dredged material from delivery vessels and pumping the dredged material to the restoration site. On-shore restoration activities would also continue for the duration of the off-loader operations. Criteria pollutant emissions were estimated for the projected annual operations of Alternative 1 with uncontrolled, diesel-powered equipment and are presented in Table 4.12-5. The total estimated emissions for the operational life of Alternative 1 (approximately 15-18 years) are the baseline emissions for the analysis of operational impacts of Alternatives 2, 3 and 4. Two operational scenarios were evaluated – the average annual operations and the maximum annual operations. During the average annual operations, which represent most years during the operational life of the project, approximately 1.2 mcy of dredged material will be processed through the off-loader. The maximum annual operational capacity of the off-loader, approximately 1.5 mcy of dredged material processed, may occur occasionally during the project life. Since Alternative 1 is the baseline condition, it is not compared to itself.

Uncontrolled criteria pollutant emissions that would be generated by the operation of Alternative 1 would exceed *de minimis* thresholds in years where the off-loader operates at its maximum capacity and emissions controls are required.

However, with the implementation of the emissions controls, annual emissions from the operation of Alternative 1 will be below *de minimis* thresholds; therefore, potential impacts from operation of Alternative 1 are considered ***less than significant.*** No mitigation is required.

Alternatives 2 and Alternative 3:

Emissions-generating activities during operation of Alternatives 2 and 3 include: emptying of the ATF by a dredge, annual dredging maintenance of the access channel, and pumping the material to the restoration site. Emissions from two operational scenarios were evaluated – the average annual operations and the maximum annual operations. During the average annual operations, which represent most years during the operational life of the ATF, approximately 2.0 mcy of dredged material will be processed through the ATF (including basin infill and access channel maintenance material). The maximum annual operational capacity of the ATF, approximately 4.0 mcy of dredged material processed, may occur occasionally during the project life. The operational life of Alternatives 2 and 3 is approximately 10 years. Criteria pollutant emissions were estimated for the projected annual operations of Alternatives 2 and 3 with uncontrolled, diesel-powered equipment and are presented in Table 4.12-5.

The total estimated emissions for the operational life of Alternatives 2 and 3 (approximately 10 years) are less than the total emissions for the operational life of the baseline (Alternative 1). Since the ATF can process more dredged material in a year than the off-loader, it will be in operation for fewer years. As a result, Alternatives 2 and 3 will generate fewer emissions during their operational project life than Alternative 1. However, uncontrolled criteria pollutant emissions that would be generated by the operation of Alternatives 2 and 3 will exceed *de minimis* thresholds in most operational years.

As shown in Table 4.12-6, with the implementation of the emissions controls in Chapter 2**,** annual emissions from the operation of Alternative 2 and 3 will be *de minimis*. Therefore, impacts from the operation of Alternative 2 and 3 will be ***less than significant.***

Table 4.12-6. Controlled Emissions (tons/year) from Average Annual and Maximum Annual Operational scenarios at the Unconfined ATF (Alternatives 2 and 3)

Component	ROG	NOX	CO	PM10
Average Annual Operations (2.0 mcy)	19.4	<74	48.6	6.5
Maximum Annual Operations (4.0 mcy)	38.2	<74	95.6	12.7
Restoration activities (HWRP)	1.8	25.4		

Note: Emission control measures, described in Chapter 2, will be implemented to ensure that the ATF operations are below the stated quantity and that total project emissions will *de minimis.*

Alternative 4: Direct Channel to BMKV Basin

Emissions-generating activities during operation of Alternative 4 include: emptying of the BMKV basin by a dredge, annual dredging maintenance of the access channel, and pumping the material to the restoration site. The access channel proposed under this alternative is longer than under Alternative 2 and 3 and will generate additional material for placement at the HWRP. Similar to Alternatives 2 and 3, it was anticipated that multiple dredging episodes will be required each year to empty the basin under Alternative 4. Emissions from two operational scenarios were evaluated – the average annual operations and the maximum annual operations. During the average annual operations, which represent most years during the operational life of the BMKV Basin, 2.0 mcy of dredged material (including basin infill and direct channel maintenance) will be processed through the basin. The maximum annual operational capacity of the BMKV Basin, approximately 4.0 mcy of dredged material processed, may occur occasionally during the project life. The operational life of Alternatives 4 is 9 years. The operational life of Alternative 4 is the shortest because construction of the access channel will generate approximately 2.5 mcy more material than Alternatives 2 and 3 that will be placed in HWRP. Criteria pollutant emissions were estimated for the projected annual operations of Alternative 4 with uncontrolled, diesel-powered equipment and are presented in Table 4.12-5.

The total estimated emissions for the operational life of Alternative 4 (approximately 9 years) are less than under baseline emissions (Alternative 1) because it would be in operation for fewer years. As a result, Alternative 4 would generate fewer emissions than Alternative 1. However, uncontrolled criteria pollutant emissions that would be generated by the operation of Alternative 4 would exceed *de minimis* thresholds in most operational years.

As shown above in Table 4.12-6, application of emission controls would reduce emissions below *de minimis* threshold levels for Alternatives 2 and 3. Application of these controls would have a similar effect to emissions for Alternative 4.

With the implementation of the emissions controls, annual emissions from the operation of Alternative 4 will be below *de minimis* thresholds. Therefore, impacts from the operation of Alternative 4 are considered ***less than significant.***

Impact AQ-1c: Emissions from the Transportation of Dredged Material

Under all alternatives, dredged material will be transported by a tug and scow from the dredging project to the off-loader or ATF basin. The proposed action, or alternatives, would accept material from dredging project located throughout the Bay Area. Since the precise origin of the dredged material is not known at this time, regional criteria pollutant emissions scenarios for each alternatives are qualitatively discussed. Project-specific criteria pollutant emissions from the transportation of dredged material to the proposed actions or alternatives, are analyzed in more detail in the NEPA/CEQA documents of those dredging projects.

Alternative 1: Dredged material Off-loader Facility (No-Action)

The off-loader will be able to accept and transfer an average of approximately 1.2 mcy of dredged material per year up to a maximum of 1.5 mcy. Between 2000 and 2007, more than 1.6 mcy of dredged material from federal projects and over 0.9 mcy of dredged material from permitted medium and small projects is produced annually on average throughout San Francisco Bay and deposited at Bay and ocean designated disposal sites. As discussed below, the average amount of dredged material received with Alternatives 2, 3, and 4 would be 1.6 mcy annually. As a result, with Alternative 1, approximately 400,000 cy of dredged material would continue to be placed at in-water placement sites annually compared to the action alternatives. The existing in-water placement sites are located throughout San Francisco Bay including SF-10, adjacent to the location of the off-loader, and SF-DODS, approximately 48 nautical mi west of the Golden Gate (see also Section 3.1). Since all in-water placement sites are currently in use, and the off-loader would be located adjacent to SF-10 site, emissions from the transportation of dredged material to Alternative 1 would be similar to past emissions for the transportation of dredged material to other in-water placement sites. Therefore, potential impacts of transporting dredged material under to Alternative 1 are considered ***less than significant.***

Alternatives 2 and Alternative 3:

Alternatives 2 and 3, the Unconfined and Confined ATF, respectively would be located in the same place; therefore, emissions from the transportation of dredged material to these alternatives would be the same. In an average year, approximately 1.6 mcy of dredged material from other dredging projects would be transferred to the ATF under Alternatives 2 and 3. Since Alternatives 2 and 3 can transfer more dredged material per year than Alternative 1, there would less use of other in-Bay or ocean disposal sites and therefore, result in fewer trips to SF-DODS. As a result, regional criteria pollutant emissions from the transportation of dredged material would be expected to be less than Alternative 1. Therefore, potential impacts from the transportation of dredged material under Alternative 2 or 3 are considered ***beneficial.***

Alternative 4: Direct Channel to BMKV Basin

Approximately 1.6 mcy of dredged material from other dredging projects would be transferred through the ATF under Alternative 4. As with Alternatives 2 and 3, Alternative 4 can transfer more dredged material per year than Alternative 1 and there would be less use of other in-Bay or ocean disposal sites and, therefore, fewer trips to SF-DODS. However, the travel distance to the BMKV basin is approximately 6.1 nautical mi longer than the travel distance to the other alternatives. As a result, regional criteria pollutant emissions from the transportation of dredged material would be more than Alternatives 2 and 3, but still less than the emissions from the transportation of dredged material to Alternative 1. Therefore, potential impacts from the transportation of dredged material under Alternative 4 are considered ***beneficial.***

Impact AQ-2: Compliance with the General Conformity Requirements.

All Alternatives

The Updated *General Conformity Applicability Analysis* (Appendix G) discusses the emissions from the Alternative 2, the proposed action, in relationship to compliance with Section 176(c) of the CAA. Emissions were estimated for both construction and operation phase of Alternative 2 as part of the

HWRP which also includes emissions from on-shore restoration activities. In both phases of the proposed action, a majority of emissions would be from excavation of the basin. Uncontrolled emissions from the construction of Alternative 2 could exceed federal *de minimis* thresholds for NO_X if construction of the ATF is completed within one calendar year and emission control measures were not implemented. Therefore, emissions control measures must be implemented to reduce the annual emissions of the overall actions related to HWRP to below the *de minimis* thresholds. The implementation of the emissions control measures as described in Chapter 2 support the finding that a Conformity Determination is not required, and the HWRP continues to comply with 40 CFR 93, Subpart B, Section 1769(c) of the CAA.

While a conformity analysis was not completed for the other alternatives, as discussed above, implementing applicable of the emissions control measures would ensure that potential emissions resulting from these alternatives would also be below the *de minimis* thresholds.

Therefore, impacts related to compliance with general conformity requirements for all alternatives are considered ***less than significant***. No mitigation is required.

Impact AQ-3—Project-related Toxic Air Contaminant Emissions

All Alternatives

The greatest potential for TAC emissions under the proposed action would be related to diesel particulate emissions associated with heavy equipment operations (construction of the facility) and tugboats (for transporting dredged material to the facility). The assessment of cancer risk resulting from prolonged exposure to TAC emissions is typically based on a 70-year exposure period. Dredged material placement and transfer activities associated with Alternatives 1-4 would occur over a period of 9 and 18 years and be included within the 70-year exposure period. There is an existing level of exposure from dredging and placement activities throughout the Bay. With the proposed action existing transportation routes and destinations of in-Bay dredged material placement sites would be diverted from these sites and other in-Bay beneficial use projects to the proposed ATF. The nearest sensitive receptors are located in excess of 2 mi from the proposed action site, and it is anticipated that TAC concentrations associated with implementation of the proposed action would be less than significant at this distance from the TAC sources. Furthermore, project duration of the proposed action or alternative is not anticipated to result in an elevated cancer risk at any sensitive receptor location. As such, project-related TAC emissions are considered ***less than significant.*** No mitigation is required.

Impact AQ-4: Project-related Emissions of Odor

All Alternatives

Odor impacts associated with the placement of dredged material on the wetlands restoration site were evaluated in the BMKV SEIS/EIR (USACE 2003); please see this document for a more specific analysis of odor impacts from on-shore restoration activities, including on-shore dredged material placement.

While offensive odors rarely cause any physical harm, they still can be very unpleasant, leading to considerable distress among the public and often generating citizen complaints to local governments and BAAQMD. Any project with the potential to frequently expose members of the public to objectionable odors is considered to have a significant impact. Common odor emitting land uses include wastewater treatment plants, sanitary landfills, transfer stations, composting facilities, petroleum refineries, asphalt batch plants, chemical manufacturing, fiberglass manufacturing, painting/coating operations (e.g., auto body shops), rendering plants, and coffee roasters. Alternatives 1-4 would not include any uses typically associated with objectionable odors. Dredged material can be malodorous; however, the location of the dredged material transfer operations under all alternatives will be more than 2 mi from sensitive receptors. Placement of dredged material underwater, in the ATF basin for Alternative 2 or 3 and the BMKV basin for Alternative 4, would prevent the release of objectionable odors from the dredged material. Odors that may be emitted from the dredged material after placement at the HWRP site would not change with the implementation of any of the alternatives. Therefore, potential impacts from odor emissions are considered less ***than significant***. No mitigation is required.

Section 4.13

Potential Impacts to Noise

4.13.1 Methodology for Impact Analysis

Section 3.13, *Affected Environment – Noise* defines the terminology used to assess noise impacts, and defines noise-sensitive land uses or receptors. Noise impacts described in this chapter are limited to potential impacts on the human environment. Noise-related impacts on marine or terrestrial species is discussed in Section 4.5, *Marine and Terrestrial Biology*.

Average daytime construction noise levels at each receiver for each construction scenario were estimated based on predictive calculations developed by the City of Boston to regulate construction noise during that City's "Big Dig" construction project (Massachusetts Turnpike Authority 2000 *in* Thalheimer 2000) and methodology developed by the Federal Transit Administration (FTA) (FTA 2006). This included evaluation of the types of construction equipment operating and associated noise emission levels, distance from receiver to construction equipment, effects of topography and ground-to-noise propagation, and period of operation of equipment. Noise levels were measured in A-weighted decibels (dBA), a composite frequency-weighting scheme that approximates the way the human ear responds to sound levels.

4.13.2 Impact Mechanisms

The construction activities associated with the proposed action and alternatives that may intermittently generate elevated noise levels at nearby noise-sensitive locations are listed below.

- Alternative 1: No Action
  - Delivery of construction materials to the onshore portions of the dredged material delivery pipeline
  - Delivery of construction materials to the off-loader facility site
  - Offshore pile-driving activity associated with off-loader facility and booster-pump platform construction
- Alternative 2: Unconfined In-Bay ATF (Proposed Action)
  - Delivery of construction materials to the onshore portions of the dredged material delivery pipeline
  - Delivery of construction materials to the ATF site
  - Offshore pile-driving activity associated with booster-pump platform construction
  - Excavation of the ATF and access channel

- Alternative 3: Confined In-Bay ATF
  - Delivery of construction materials to the onshore portions of the dredged material delivery pipeline
  - Delivery of construction materials to the ATF site
  - Offshore pile-driving activity associated with booster-pump platform construction
  - Construction of the structural ATF enclosure
  - Excavation of the ATF
- Alternative 4: Direct Channel to BMKV Basin
  - Delivery of construction materials to the onshore BMKV basin and short transfer pipeline
  - Construction of the perimeter levees at the BMKV basin
  - Breaching of the outboard levee following completion of the BMKV basin
  - Excavation and periodic maintenance dredging of the direct channel and the BMKV basin

The construction approach will vary based on the alternative selected. The previously constructed authorized off-loader facility required approximately 4 months. Under the proposed action, construction of the ATF basin is estimated to require 6 months. Construction of the direct channel and BMKV basin is also estimated to require 6 months.

Elevated noise levels associated with project operational activities include operation of auxiliary feedwater and in-line booster pumps, operation of an off-loader facility, and operation of a hydraulic dredge within the ATF basin or the BMKV basin. The total combined horsepower of either alternative including booster pumps is assumed to be similar.

Delivery of Construction Materials Onshore

Noise analysis for the delivery of construction material onshore is based on the use of an equipment inventory that is anticipated to be used by a prudent and well-equipped contractor. Table 4.13-1 presents a list of noise generation levels for the anticipated equipment inventory.

Table 4.13-1. Construction Equipment Noise Emission Limits

Equipment	Typical Noise Level (dBA) 50 feet from Source[1]	Utilization Factor
Crane, Derrick	85	0.2
Dredge, Clamshell	84	0.4
Dredge, Hydraulic	79	1.0
Loader	80	0.4
Pile Driver (Impact)	101	0.2
Pump (Dewatering)	593	0.5
Truck	84	0.4
Tugboat	821	0.5

Note:

[1]The term "source" refers to the noise-generating equipment.

Sources:

Massachusetts Turnpike Authority, 2000 in Thalheimer, 2000; Geier & Geier Consulting, 1997ICF Jones & Stokes measurements for a similar dredging operation (Environmental Science Associates, 2003); ICF Jones & Stokes calculations based on Hoover and Keith, 2000

A conservative assumption for delivery of construction material onshore is simultaneous and continuous operation of the three loudest pieces of equipment (crane, loader, and truck) over at least a 1-hour period for a combined source noise level. The combined sound level of these three pieces of equipment associated with delivery of construction materials is 78 dBA, equivalent sound level (L_{eq}) measured at 50 feet from the source. Table 4.13-2, which assumes this combined source level, summarizes predicted noise levels at various distances from delivery activities using methodology recommended by FTA (2006).

Table 4.13-2. Estimated Construction Noise in the Vicinity of Delivery Activities

Entered Data:	
Construction Condition: Delivery of construction materials	
Source Sound level (dBA) at 50 feet =	78
Average Height of Sources—Hs (feet) =	10
Average Height of Receiver—Hr (feet) =	5
Ground Type (soft or hard) =	Hard
Calculated Data:	
Effective Height (Hs+Hr)/2 =	7.5
Ground factor (G) =	0.00

Distance Between Source and Receiver (feet)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA)[1]
50	0	0	78
100	-6	0	72
200	-12	0	66
300	-16	0	62
400	-18	0	60
500	-20	0	58
600	-22	0	56
700	-23	0	55
800	-24	0	54
900	-25	0	53
1,000	-26	0	52
2,000	-32	0	46
3,000	-36	0	42
4,000	-38	0	40
5,280	-40	0	NA[2]
7,920	-44	0	NA
10,560	-46	0	NA
15,840	-50	0	NA

[1] Calculations are based on FTA guidance. This calculation does not include the effects, if any, of local shielding that may reduce sound levels further.

[2] NA = Calculated noise levels that resulted in levels below ambient.

Source: FTA 2006.

Delivery of Construction Materials Offshore

Delivery of construction material offshore to the proposed project or alternatives is expected to require tugs and cranes. The conservative assumption for this scenario involves a combined sound level of one crane and two tugs operating simultaneously and continuously over at least a 1-hour period. This equates to a combined source noise level of 83 dBA, L_{eq} measured at 50 feet from the source. Table 4.13-3 calculates the estimated sound levels from barge delivery and basin construction activities as a function of distance using methodology recommended by FTA (2006).

Table 4.13-3. Estimated Construction Noise in the Vicinity of Barge Delivery and Basin Excavation Activities

Entered Data:			
Construction Condition: Delivery of materials to ATF facility			
Source Sound level (dBA) at 50 feet =			83
Average Height of Sources – Hs (feet) =			10
Average Height of Receiver - Hr (feet) =			5
Ground Type (soft or hard) =			Hard
Calculated Data:			
Effective Height (Hs+Hr)/2 =			7.5
Ground factor (G) =			0.00
Distance Between Source and Receiver (feet)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA)[1]
50	0	0	83
100	-6	0	76
200	-12	0	70
300	-16	0	67
400	-18	0	64
500	-20	0	63
600	-22	0	61
700	-23	0	60
800	-24	0	58
900	-25	0	57
1,000	-26	0	56
2,000	-32	0	50
3,000	-36	0	47
4,000	-38	0	44
5,280	-40	0	42
7,920	-44	0	NA[2]
10,560	-46	0	NA
15,840	-50	0	NA

[1] Calculations are based on FTA guidance. This calculation does not include the effects, if any, of local shielding that may reduce sound levels further.

[2]NA = Calculated noise levels that resulted in levels below ambient.

Source: FTA 2006.

Dredging Activities

Excavation of the ATF and the direct channel is expected to be completed by dredging. Periodic maintenance dredging of the ATF, the BMKV basin, and the direct channel will also be required.

Assuming continuous dredging activities over at least a 1-hour period, this will equate to a noise level of 80 dBA, L_{eq} measured at 50 feet from the source. Table 4.13-4 calculates the estimated sound levels from dredging activities as a function of distance using methodology recommended by FTA (FTA 2006).

Table 4.13-4. Estimated Construction Noise in the Vicinity of Dredging Activities

Entered Data:			
Construction Condition: Delivery of materials to ATF facility			
Source Sound level (dBA) at 50 feet =			80
Average Height of Sources – Hs (feet) =			10
Average Height of Receiver - Hr (feet) =			5
Ground Type (soft or hard) =			Hard
Calculated Data:			
Effective Height (Hs+Hr)/2 =			7.5
Ground factor (G) =			0.00
Distance Between Source and Receiver (feet)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA) [1]
50	0	0	80
100	-6	0	74
200	-12	0	68
300	-16	0	64
400	-18	0	62
500	-20	0	60
600	-22	0	58
700	-23	0	57
800	-24	0	56
900	-25	0	55
1,000	-26	0	54
2,000	-32	0	48
3,000	-36	0	44
4,000	-38	0	42
5,280	-40	0	40
7,920	-44	0	NA[2]

Distance Between Source and Receiver (feet)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA)[1]
10,560	-46	0	NA
15,840	-50	0	NA

[1] Calculations are based on FTA guidance. This calculation does not include the effects, if any, of local shielding that may reduce sound levels further.

[2]NA = Calculated noise levels that resulted in levels below ambient.

Source: FTA 2006.

Pile Driving Activities

Pile-driving was required offshore for the authorized off-loader facility and is anticipated to be required for the proposed ATF and the confined ATF (Alternative 3). Approximately 26 piles (each 24 to 36 inches in diameter) were required for the authorized off-loader facility. Based on the noise level for an impact pile driver (Table 4.13-1), Table 4.13-5 presents the estimated sound levels from pile driving activities as a function of distance using methodology recommended by FTA (2006).

Table 4.13-5. Estimated Construction Noise in the Vicinity of Active Pile Driving Activities

Entered Data:	
Construction Condition: Pile driving	
Source Sound level (dBA) at 50 feet =	94
Average Height of Sources—Hs (feet) =	10
Average Height of Receiver—Hr (feet) =	5
Ground Type (soft or hard) =	Hard
Calculated Data:	
Effective Height (Hs+Hr)/2 =	7.5
Ground factor (G) =	0.00

Distance Between Source and Receiver (feet)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA)[1]
50	0	0	94
100	-6	0	88
200	-12	0	82
300	-16	0	79
400	-18	0	76
500	-20	0	74
600	-22	0	73
700	-23	0	71

Distance Between Source and Receiver (feet)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA) [1]
800	-24	0	70
900	-25	0	69
1,000	-26	0	68
2,000	-32	0	62
3,000	-36	0	59
4,000	-38	0	56
5,280	-40	0	54
7,920	-44	0	50
10,560	-46	0	48
15,840	-50	0	44

[1] Calculations are based on FTA guidance. This calculation does not include the effects, if any, of local shielding that may reduce sound levels further.

Source: FTA 2006

4.13.3 Thresholds of Significance

For the purposes of this analysis, an impact was considered to be significant and to require mitigation if:

- Noise from construction activities would exceed one hour Leq noise levels of 60 dBA (6:00 a.m. to 10:00 p.m.) or 45 dBA (10:00 p.m. to 6:00 a.m.) beyond the property line of the noise-generating activity (City of Novato Municipal Code 19.22.070).
- Noise from operational activities would exceed one hour Leq noise levels of 50 dBA (7:00 a.m. to 10:00 p.m.) or 45 dBA (10:00 p.m. to 7:00 a.m.) at noise sensitive locations including shoreline recreational areas and residential areas adjacent to the site (County of Marin General Plan Noise Element Implementing Program NO-1.a).

4.13.4 Impacts and Mitigation Measures

The following table summarizes the impacts and the significance determinations for each of the alternatives relative to Noise.

Table 4.13-6. Summary of Noise Impacts

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact NO-1: Exposure of Existing Residences and Shoreline Recreation Areas to Construction Noise in Excess of Local Standards	Less than significant	Less than significant	Less than significant	Less than significant
Impact NO-2: Exposure of Existing Residences and Shoreline Recreation Areas to Operational Noise in Excess of Local Standards	Less than significant	Less than significant	Less than significant.	Less than significant with mitigation

Potential adverse impacts to fish, marine mammals, waterfowl, and seabirds resulting from project-related noise are addressed in Section 4.5, *Marine and Terrestrial Biology*.

Impact NO-1: Exposure of Existing Residences and Shoreline Recreation Areas to Construction Noise in Excess of Local Standards

Alternative 1: No Action

This alternative was evaluated and selected for implementation in the HWRP EIS/EIR. Specific construction-related noise-generating activities included installation of a pile dolphin system to secure the off-loader facility; mobilization of the off-loader facility, deck and equipment barges, and booster pumps; and installation of a submerged electrical cable for the booster pump.

Table 4.13-1, above, presents a list of noise generation levels for various types of equipment anticipated to be used during construction. The magnitude of construction noise impacts is assumed to depend on the type of construction activity, the noise level generated by various pieces of construction equipment, and the distance between the activity and noise-sensitive receivers. The expected noise levels were calculated based on an attenuation rate of 6 dB per doubling of distance (FTA 2006). Any shielding effects that might result from local barriers were not included as part of the analysis, thus making the analysis conservative. Additional attenuation from ground absorption was also excluded because water generally functions as hardscape.

The expected noise levels by construction activity are presented in Tables 4.13-2 through 4.13-5. As shown in the tables construction under Alternative 1 would not expose residences or shoreline recreation areas to significant levels of construction noise. The nearest residential units in the Bel Marin Keys community are located 6.1 mi from the authorized off-loader facility site and 1.2 mi from the transfer pipeline outfall. McNears Beach County Park and China Camp State Park are the closest shoreline recreation areas at 1.5 mi from the off-loader facility site. Truck trips for equipment deliveries and loading are in areas far enough from sensitive receptors where construction noise was attenuated to below threshold levels (Table 4.13-2). Therefore, potential construction-related noise impacts are considered ***less than significant***. No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

This alternative is expected to generate construction noise during excavation of the ATF basin and associated facilities. Noise-generating activities include dredging of the ATF basin and access channel; and installation of a booster pump. Noise levels are expected to be similar to noise associated with Alternative 1 off-loader facility and booster-pump construction (see Tables 4.13-2 through 4.13-5). Because sensitive receptors will be at least 1.5 mi from the ATF site and 1.2 mi from the transfer pipeline outfall, potential construction-related noise impacts are considered ***less than significant***. No mitigation is required.

Alternative 3: Confined In-Bay ATF

This alternative is expected to generate construction noise during excavation of the ATF basin and associated facilities. Noise-generating activities include dredging of the ATF basin; installation of ATF perimeter sheet piles; and installation of a booster pump. Noise levels are expected to be similar to noise associated with off-loader facility and booster-pump construction as under Alternative 1 (see Tables 4.13-2 through 4.13-5). Because sensitive receptors will be at least 1.5 mi from the ATF site and 1.2 mi from the transfer pipeline outfall, potential construction-related noise impacts are considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel to BMKV Basin

This alternative is expected to generate construction noise during the excavation of the direct channel and BMKV basin. Noise-generating activities include dredging of the BMKV basin; construction of the perimeter levee surrounding the BMKV basin; and installation of a dredge and short transfer pipeline on the BMKV site. Impacts under this alternative are expected to be similar to those described under Alternative 1, except basin and channel excavation will occur and pile driving will not. These noise levels will occur just over 1.0 mi from the nearest residential unit in the Bel Marin Keys community, in areas considered far enough from sensitive receptors where construction noise will attenuate to below threshold levels (see Tables 4.13-2 through 4.13-4). Potential construction-related noise impacts are considered ***less than significant***. No mitigation is required.

Impact NO-2: Exposure of Existing Residences and Shoreline Recreation Areas to Operational Noise in Excess of Local Standards

Alternative 1: No Action

This alternative was evaluated and selected for implementation in the HWRP EIS/EIR. Operation of the authorized off-loader facility, including booster pumps, is estimated to result in a combined horsepower of approximately 11,000 to 12,000. Assuming concurrent operation of all pumps at 100% utilization, noise generated by operating the authorized off-loader facility is predicted to be inaudible to noise sensitive residential and shoreline recreation areas, which are located at least 1.5 mi from the authorized off-loader facility platform (see Table 4.13-7, below). Additionally, booster pump noise levels nearer to shore do not exceed threshold levels for the Bel Marin Keys residents (over 1.2 mi away). Overall, the daytime threshold of 50 dBA and the nighttime threshold of 45 dBA are not exceeded at noise sensitive areas. Consequently, this impact is considered ***less than significant***, and no mitigation is required.

Alternatives 2 and Alternative 3:

Operational noise impacts under Alternatives 2 and 3 are expected to be similar to those described above for Alternative 1. The predicted noise levels at various distances from operation of the proposed ATF will not exceed local thresholds for daytime or nighttime noise levels. This impact is considered ***less than significant***. No mitigation is required.

Alternative 4: Direct Channel and the BMKV Basin

Under Alternative 4, operational noise levels would be similar to those described above for Alternative 1 for basin operations, the transport of dredged material via the direct channel and maintenance of the channel itself through periodic dredging. Table 4.13-3 provides estimated noise levels resulting from material delivery, while Table 4.13-4 provides estimated noise levels resulting from maintenance dredging. Table 4.13-7 summarizes predicted noise levels at various distances from operation of the direct channel. Noise associated with BMKV basin operations will occur just over 1.0 mi from the nearest residential unit in the Bel Marin Keys community, in areas considered far enough away such that operational noise levels would not be expected to exceed daytime threshold levels.

Operation of booster pumps and a maintenance dredge at the BMKV basin has the potential to exceed the nighttime threshold of 45 dBA at the adjacent residences of the Bel Marin Keys community. **Mitigation Measure NO-MM-1** requires implementation of noise controls to prevent exceedances of the nighttime threshold. With implementation of this mitigation measure, the potential for nighttime noise impacts is considered ***less than significant***.

Mitigation Measure NO-MM-1: Employ Noise-Reducing Operation Practices and Controls. Specific noise control measures to prevent exceeding the nighttime noise threshold will be included in the Environmental Protection Plan, Operation Plan, and in appropriate contract documents. Measures may include, but are not limited to restricting operation hours or using noise-attenuating buffers.

Table 4.13-7. Estimated Operational Noise in the Vicinity of the Project Area

Entered Data:			
Condition: Operational noise from ATF components			
Source Sound level (dBA) at 50 feet =			92
Average Height of Sources—Hs (feet) =			10
Average Height of Receiver—Hr (feet) =			5
Ground Type (soft or hard) =			Hard
Calculated Data:			
Effective Height (Hs+Hr)/2 =			7.5
Ground factor (G) =			0.00
Distance Between Source and Receiver (feet)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA) [1]
50	0	0	92

Distance Between Source and Receiver (feet)	Geometric Attenuation (dB)	Ground Effect Attenuation (dB)	Calculated Sound Level (dBA) [1]
100	-6	0	86
200	-12	0	80
300	-16	0	76
400	-18	0	74
500	-20	0	72
600	-22	0	70
700	-23	0	69
800	-24	0	68
900	-25	0	67
1,000	-26	0	66
2,000	-32	0	60
3,000	-36	0	56
4,000	-38	0	54
5,280	-40	0	51
7,920	-44	0	48
10,560	-46	0	45
15,840	-50	0	NA[2]

[1]Calculations are based on FTA guidance. This calculation does not include the effects, if any, of local shielding that may reduce sound levels further.

[2]NA = Calculated noise levels that resulted in levels below ambient.

Source: FTA 2006

Section 4.14
Potential Impacts to Aesthetics

4.14.1 Methodology for Impact Analysis

The methodology used to assess visual resources impact from the project includes the following.

1. Objectively identify the visual features (visual resources) within the project viewshed.
2. Assess the character and quality of those resources relative to overall regional visual character.
3. Identify the importance to people, or *sensitivity*, of views of visual resources in the viewshed.

By establishing the baseline (existing) conditions, a proposed project or other change to the viewshed can be objectively evaluated for its degree of impact. The degree of impact depends both on the magnitude of change in the visual resource (i.e., visual character and quality) and on viewers' responses to and concern for those changes. This general process is similar for all established federal procedures of visual assessment (Smardon et al. 1986) and represents a suitable methodology of visual assessment for other projects and areas.

Section 3.14, *Aesthetics*, defines the concepts and terminology used to assess visual resources and evaluate visual character, quality, and sensitivity.

4.14.1.1 Existing Views and Visual Simulations

To support the visual impact analysis, both current digital color photographs, as well as visual simulations from representative viewpoints for the project were prepared. The locations for the current photos and/or simulations were selected to depict the most sensitive public views that are subject to change. The simulations were prepared based on digital color photographs of the project area.

To depict a worst-case view, the visual simulations show the existing off-loader facility (Alternative 1: No Action) sitting within the sheet metal walls of the Confined In-Bay ATF (Alternative 3). Although they would not be combined when implemented, these two alternatives were depicted together to provide a comparison of the approximate size and configuration of each. Additionally, from a distance, the existing off-loader facility appears similar to (though larger than) a dredger or scow and the image therefore simulates the appearance of a dredge vessel placing materials within the sheet metal walls proposed under Alternative 3.

Because Alternative 2 would comprise only navigational aids above the water level, it would therefore not be visible from distant vantage points. As such, Alternative 2 was not simulated in this study.

Finally, the potential aesthetic impacts of construction activities on the BMKV site were analyzed in the previous BMKV SEIS/EIR (USACE, 2003). Although it did not specifically address the BMKV basin and perimeter levees proposed in Alternative 4, the following analysis is based on the photographic record and conclusions in that document, as well as on current photos of existing conditions.

4.14.2 Impact Mechanisms

The proposed project includes placement of a dredged material transfer facility within San Pablo Bay or at the BMKV site. For Alternatives 1 and 3, this would represent a change in the visual character of the Bay within the project area. For Alternative 4 this would represent a change in the visual character of the BMKV site near the outboard levee. Impact mechanisms for changes in visual character of San Pablo Bay include the ATF facility itself, the BMKV basin and perimeter levees, navigational aids, and increased barge and scow traffic.

4.14.3 Thresholds of Significance

For the purposes of this analysis, an impact was considered to be significant with regard to visual resources if it would:

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

4.14.4 Impacts and Mitigation Measures

The following table summarizes the impacts and the significance determinations for each of the alternatives, relative to Aesthetics.

Table 4.14-1. Summary of Aesthetics Impacts

Impacts	Alternative 1: Dredged Material Off-Loader Facility (No Action)	Alternative 2: Unconfined In-Bay ATF (Proposed Action)	Alternative 3: Confined In-Bay ATF	Alternative 4: Direct Channel to BMKV Basin
Impact AE-1: Substantially Adversely Affect Scenic Vistas of San Pablo Bay	Less than significant	Less than significant	Less than significant with mitigation	Less than significant
Impact AE-2: Substantially Degrade Existing Visual Character or Quality	Less than significant	Less than significant	Less than significant with mitigation	Less than significant
Impact AE-3: Create a New Source of Substantial Light or Glare	Less than significant	Less than significant	Less than significant with mitigation	Less than significant with mitigation

Impact AE-1: Substantially Adversely Affect Scenic Vistas of San Pablo Bay

Due to its location within San Pablo Bay, the proposed ATF would be most visible from the open bay waters and higher vantage points in Marin County. As such, this analysis focuses on changes in the viewsheds of riders along the San Francisco–Vallejo ferry routes, recreational boaters, visitors at China Camp State Park, and residents on Point Pinole. The three viewpoints for which photo simulations were conducted include the San Francisco – Vallejo Ferry (see Figure 4.14-1), Point San Pedro (see Figure 4.14-2), and Point Pinole (see Figure 4.14-3). As described earlier, to represent the worst case scenario, the photo simulations were developed using the depiction of both the off-loader facility and the Confined In-Bay ATF because these facilities will be visible above the water surface.

Photographs of existing views from the Bel Marin Keys community are presented in Figure 3.14-3 and 3.14-10.

Alternative 1: No Action

The off-loader facility appears as a typical barge or industrial facility within the wide expanse of Bay waters, competing with numerous maritime facilities in the fore- and middlegrounds. The off-loader facility and increased scow and barge traffic during placement and subsequent transfer of dredged materials appear as an industrial operation within the open bay. This potential clustering of vessels would contribute to the varied maritime character represented along the ferry routes. Given the total volume of marine traffic and the maritime history of the Bay, the potential aesthetic impact of Alternative 1 is considered ***less than significant***. No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

San Pablo Bay has an extent of approximately 64,000 ac; placement of a 34-ac ATF facility within the Bay would only constitute 0.05% of the total San Pablo Bay surface area. As such, aesthetic impacts of the proposed ATF would be localized. San Pablo Bay is regularly filled with ships, barges, and sailboats of various sizes and speeds. The increased scow and barge traffic during placement and subsequent transfer of dredged materials at the unconfined ATF would appear as industrial operations within the open bay. The physical evidence assessed for this analysis suggests that the off-loader facility and booster pump station could be seen as a continuation of the maritime atmosphere and Bay views similar to existing views, which include ferry service, shipping activities, and recreational boating.

Alternative 2 would not place any permanent structure above water level, and would therefore have minimal impact on views of San Pablo Bay. Increased scow and barge traffic at the basin site would appear as typical marine transportation. Navigational aids and night lighting would be localized and temporary (for the life of the project). This impact is considered ***less than significant***. No mitigation is required.

Alternative 3: Confined In-Bay ATF

As stated above, placement of a 34-ac transfer facility within San Pablo Bay would only constitute 0.05% of its surface area. Also, the existing booster pump station fits in with the maritime character of the area. However, construction of the perimeter wall in Alternative 3 may create visual interruption from some vantage points. Although Alternative 3 would be relatively unnoticeable to most recreational boaters and commuters on the ferry routes, views from China Camp or Point San Pablo may be affected. A short sheet metal wall would be visible (10–18 feet of the enclosure would be visible depending on the tide), as would some navigational buoys and other aids. Increased barge and scow traffic within the enclosure may distract from the unity of the Bay expanse, where vessels are generally moving and views changing ever so slightly over time.

The perimeter enclosure may have the greatest impact on recreational users on bluffs or slopes within China Camp State Park or residential lots on Point San Pablo. Because these viewer groups may be located up to 100 feet above sea level, the expanse of the confinement walls would be visible. Although the wall would be short compared to the scows, barges, and ships in San Pablo Bay, the enclosure would create a visual interruption within the Bay expanse. However, the physical evidence assessed for this analysis suggests that the confinement could be seen as a continuation of the maritime atmosphere, with associated shipping and industrial activities.

The enclosure may also visually impact recreational fisherpeople navigating small boats adjacent to or around the proposed ATF basin site. However, most recreational fisherpeople typically stay nearer to the shoreline than the open waters of the Pinole Shoal Channel where the Confined In-Bay ATF would be located. Although the maritime atmosphere would be minimally affected with implementation of Alternative 3, this impact is considered potentially significant. In order to reduce potential aesthetic impacts from the sheet metal wall's texture, color, or reflectivity, USACE and Conservancy shall implement **Mitigation Measure AE-MM-1**. With implementation of this mitigation measure, this impact is considered ***less than significant***.

> **Mitigation Measure AE-MM-1: Surface Treatment to Reduce Daytime Glare.** To minimize any effects from reflected light on the Bay, USACE shall finish all surfaces on the sheet metal containment structure with paint or other treatments that minimize daytime glare and reflectivity. USACE and Conservancy shall apply paint or surface treatments before the facility is installed in the Bay. Surface treatments shall be selected with consideration given to those products that will not corrode by wind and wave action over time.

Alternative 4: Direct Channel to BMKV Basin

Construction of a new channel across open bay waters and mudflats would be noticeable only to the most discerning viewer groups. The direct channel may be viewed as part of the wider complex of

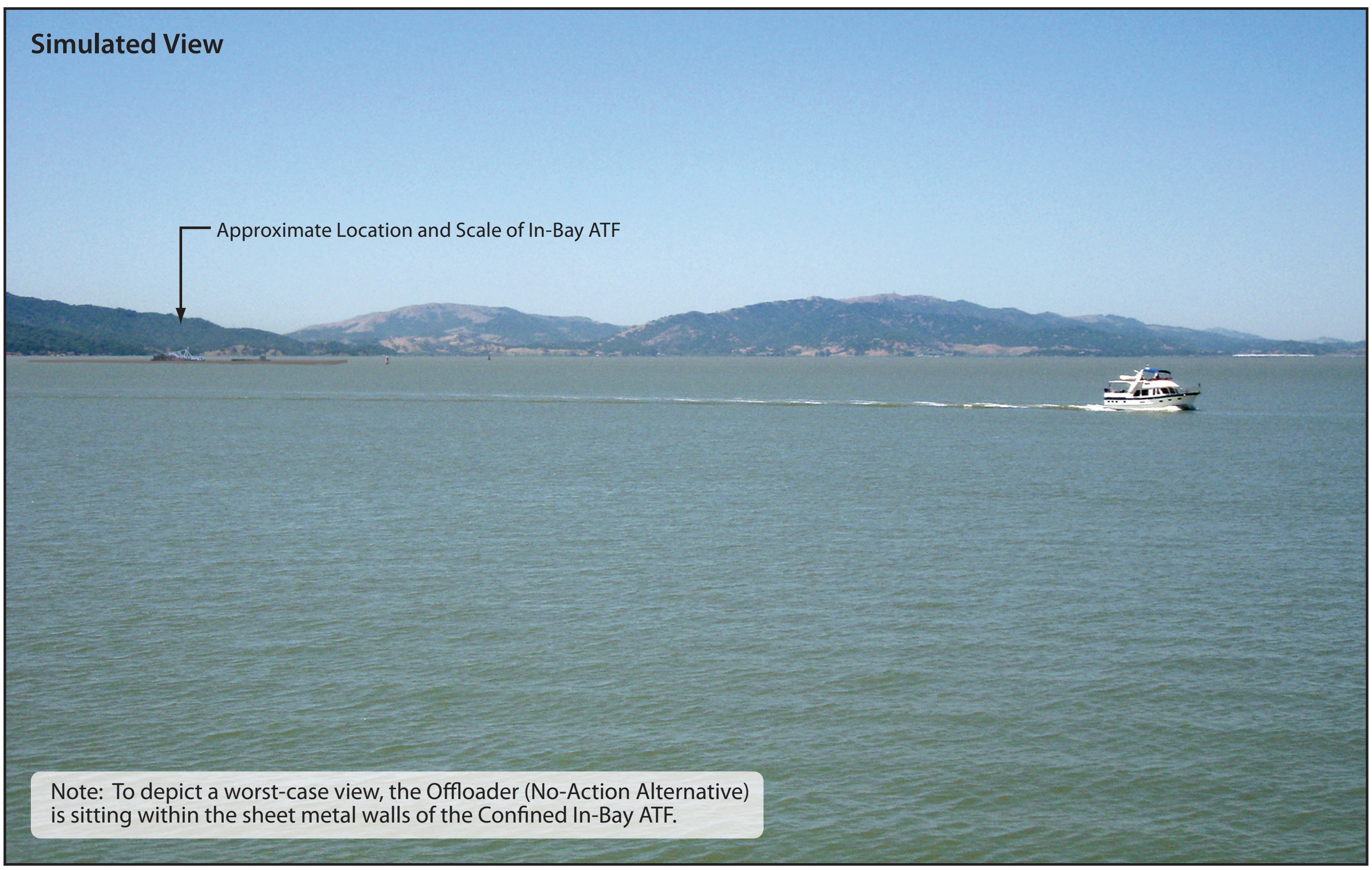

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Figure 4.14-1
Existing and Simulated Views of In-Bay ATF from the Vallejo-San Francisco Ferry

05614.05 (rev.9-08)

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Figure 4.14-2
Existing and Simulated Views of In-Bay ATF from Point San Pedro

05614.05 (rev9-08)

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Figure 4.14-3
Existing and Simulated Views of In-Bay ATF from Point Pinole

channels visible at low tide across the surrounding mudflats. Within a vast bay filled with marine and recreational traffic, creek and channel outlets, bridges, and port facilities, this would constitute a minor change in scenic views. Navigational buoys and other aids may direct dredged material transport vessels to the direct channel, but would not likely interrupt views for other boaters or visitors.

Due to their higher vantage point recreational users within China Camp State Park or residential lots on Point San Pedro may be impacted the greatest by construction and maintenance of the direct channel. New heavy vessel traffic and dredging equipment associated with delivery of the dredged material to the BMKV basin may interrupt views that have historically contained only smaller recreational boats. Additionally, periodic maintenance dredging of the direct channel would increase heavy vessel traffic in China Camp and Point San Pedro viewsheds. Fishing and recreational boats navigating in shallow waters nearer to the shoreline may also be distracted by the channel, BMKV basin, and adjacent pump station facilities at the BMKV site.

Existing views from private residences in the Bel Marin Keys community will be altered by the HWRP itself as presented in the visual impacts analysis in the BMKV SEIS/EIR. Only a portion of San Pablo Bay is visible in the far background because of the distance to the Bay and the presence of the existing outboard levee. Installation of a hydraulic dredge and booster pump facility to transfer dredged material from the basin to the HWRP site may be visible to some Bel Marin Keys residents. However, under the current restoration activities that are ongoing, the constructed perimeter levees were sited at a higher elevation and at a closer distance to Bel Marin Keys residents than the proposed BMKV basin and its ancillary facilities would be under Alternative 4. The existing electric substation and associated power poles and line extend out from the Bel Marin Keys community out to an existing pump station located adjacent to where the proposed BMKV basin would be sited. To implement Alternative 4, new power poles or lines may need to be run out to the basin area to support the potential booster pump station or for the dredges. However, because the existing substation is already part of the viewshed from the Bel Marin Keys community, and because the new facilities constructed under this alternative would be the same height or lower than the existing outboard levee, implementation of Alternative 4 would not create a new visual impact. Specifically, from this viewpoint some middleground views of the grassfields would be blocked, but views of the Bay expanse would remain. Additionally, the transport vessels that would be delivering material to the BMKV basin would be visible above the outboard and perimeter levees. However, these facilities and transport vessels could be seen as a temporary expansion of the nearshore maritime activities on San Pablo Bay. The partial obstruction of views due to Alternative 4 is not considered substantial because these activities would be located more than 1.0 mi from the nearest residential unit and would be relatively small given the wide expanse of San Pablo Bay. Although Alternative 4 would result in minor changes to scenic views of San Pablo Bay, the impact would be localized and is considered ***less than significant***. No mitigation is required.

Impact AE-2: Substantially Degrade Existing Visual Character or Quality

The proposed ATF would be within the distant, but frequent, viewshed of local residents and drivers along roadways within the Point San Pedro, Point Pinole, and Point San Pablo areas. The BMKV basin, associated dredging and pump station facilities, and material delivery vessels would all be within the viewshed of some Bel Marin Keys residents. As such, this analysis focuses on changes in the existing visual quality of views by these receptors.

Alternative 1: No Action

Permanent placement of the off-loader facility within the project area is relatively unnoticeable to most Bay Area residents and travelers. The off-loader facility appears as a typical barge or industrial facility within the wide expanse of Bay waters, and competes with numerous maritime facilities within the fore- and middlegrounds. Views of the Bay from adjacent residential neighborhoods and roadways contain a wide variety of maritime, industrial, and open space uses. The distance from the existing facility to the residential receptors is at a distance such that the off-loader facility and booster pump appear quite small. Additionally, the vastness of the Bay expanse dwarfs the cluster of scows and barges that converge at the off-loader facility during the disposal periods and do not substantially degrade the existing visual character or quality of the project area. Therefore, this impact is considered ***less than significant***. No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Alternative 2 would not place any structure above water level, and would therefore have no impact to views of San Pablo Bay. The booster pump station already exists at a distance such that its appearance from residential receptors is small. Increased scow and barge traffic at the proposed ATF basin site would simply appear as typical marine transportation. Therefore the potential impact on the existing visual character or quality under Alternative 2 is considered ***less than significant***. No mitigation is required.

Alternative 3: Confined In-Bay ATF

Although the perimeter wall and booster pump station in Alternative 3 would be relatively unnoticeable to most Bay Area residents and travelers, the confinement structure may create minor visual interruption from some vantage points. A short sheet metal wall would be barely visible from adjacent lands (10–18 feet of the enclosure would be visible depending on the tide), as would some navigational buoys and other aids. The distance from the proposed ATF basin under this alternative to the residential receptors on San Pedro Point or Parchester Village is far (about 2.2 to 3.0 mi), but these viewer groups which are located on higher elevations would experience minor changes in views. Residential lots on Point San Pablo would be able to see the confinement walls. Although the wall would be short compared to the scows, barges, and ships on San Pablo Bay, the enclosure would create a visual interruption within the Bay expanse.

The confinement wall may also be visible to recreational users and drivers along China Camp State Park, McNears Beach, or Point Pinole. However, these viewer groups are generally focused on the task at hand, and, therefore, the confinement wall would appear as a minor maritime element within sweeping Bay views. Although this low-lying enclosure would not substantially interrupt the view nor would it detract from the scene's vividness or intactness with this Alternative, this impact is considered potentially significant. In order to reduce potential aesthetic impacts from the sheet metal wall's texture, color, or reflectivity, USACE and Conservancy shall implement **Mitigation Measure AE-MM-1**. With implementation of this mitigation measure, the potential impact on the existing visual character or quality available to recreational users and motorists under Alternative 3 is considered ***less than significant***.

Alternative 4: Direct Channel to BMKV Basin

Excavation of the direct channel to the BMKV site may be visible from upland and hillside areas in Marin County. Residents, recreational users, and drivers along China Camp State Park, McNears Beach, or Point Pinole may view the direct channel as part of the wider complex of channels visible at low tide across the surrounding mudflats. Within a vast bay filled with marine and recreational traffic, creek and channel outlets, bridges, and port facilities, this would constitute a minor change in scenic views. Therefore, the proposed direct channel would constitute a new element that is relatively consistent with the existing character and quality of the Bay environment.

The booster pump station and other dredging equipment necessary to support the transfer of dredged materials at the BMKV basin, however, may serve as a minor disruption of middle ground views for some Bel Marin Keys residents. Additionally, the transport vessels that would be delivering material to the BMKV basin would be visible above the outboard and perimeter levees. Construction-related activities associated with the HWRP effort are already present in middle ground views for these residents, thus interrupting their viewscape toward the proposed BMKV basin location. Subsequently, viewer sensitivity from the Bel Marin Keys residences is expected to be low. Additionally, the transport vessels (located just beyond the outboard levee) could be seen as a temporary expansion of the nearshore maritime activities on San Pablo Bay. The partial obstruction of views due to Alternative 4 is not considered substantial because these activities would be located more than 1.0 mi from the nearest residence and would be relatively small given the size of the restoration site (1,575 ac) and San Pablo Bay beyond. Therefore, the potential impact on the existing visual character or quality under Alternative 4 is considered ***less than significant***. No mitigation is required.

Impact AE-3: Create a New Source of Substantial Light or Glare

The proposed ATF and alternatives would create new sources of light on San Pablo Bay due to navigational aids, increased barge and scow traffic, and reflection from transfer facilities. Although barges or scows may be traversing San Pablo Bay to deliver dredged materials at night, they would not create a significant additional source of nighttime lighting. Additionally, the wide expanse of nighttime lights generated by urban development in the background of views from both the Marin and Contra Costa shorelines would generally overpower any navigational and work lighting necessary for the proposed project.

Alternative 1: No Action

The existing off-loader facility and booster pump station have not caused any sources of glare that adversely impact riders along the Vallejo—San Francisco ferry routes, project area residents, recreational boaters on San Pablo Bay, and visitors China Camp State Park. The off-loader facility appears as a typical barge or industrial facility, and creates some reflection on sunny days from its hardware, barge decks, or booster pump station. However, such reflection is temporary and sporadic, and is seen only from certain angles while boaters are passing adjacent to the facility. The wide expanses of open bay water offer a far larger surface for reflection of the sun during the early morning and late afternoon when it is low in the sky. There is some nighttime lighting on navigational aids, which is necessary for marine safety and to light the work areas on the off-loader facility and booster pump structures, but these do not detract from nighttime views of San Pablo Bay. Therefore, potential light and glare impacts of Alternative 1 are considered ***less than significant***. No mitigation is required.

Alternative 2: Unconfined In-Bay ATF (Proposed Action)

Alternative 2 would not place any new structures above water level, and would therefore have no impact to views of San Pablo Bay. Small navigational buoys and other aids would have a negligible impact on nighttime views of San Pablo Bay, and any reflection or lights from the already existing booster-pump station are minimal. Therefore, the potential light and glare impact of Alternative 2 is considered ***less than significant***. No mitigation is required.

Alternative 3: Confined In-Bay ATF

Alternative 3 may generate glare for riders along the San Francisco–Vallejo ferry routes, project area residents, recreational boaters on the Bay, and visitors at China Camp State Park. A short sheet metal wall would be visible (10–18 feet of the enclosure would be visible depending on the tide) and is expected to create new glare or reflection. Additionally, scows and barges disposing of dredged materials at the basin site may generate additional reflection on sunny days. Though they would be temporary and sporadic, the confinement could serve as a stationary source of bright, reflective light. There will be some nighttime lighting on navigational aids, which is necessary for marine safety, as well as work lighting on the booster pump station. But these would not detract from nighttime views of the Bay. Although this represents a potential minor new contribution to light and glare on the Bay, this impact is still considered potentially significant.

To reduce potential aesthetic impacts from the sheet metal wall's texture, color, or reflectivity, USACE and Conservancy shall implement **Mitigation Measure AE-MM-1**. With implementation of the mitigation measure, the potential light and glare impact under Alternative 3 is considered ***less than significant***.

Alternative 4: Direct Channel and BMKV Basin

Although excavation of the direct channel itself would not generate light or glare, the booster pump station and other dredging equipment necessary to support the transfer of dredged materials at the BMKV basin may create reflection on sunny days. Although such reflection would be temporary and sporadic, seen only from certain angles for boaters or other recreationalists passing adjacent to the facility, it may have more impacts on the nearby residents of the Bel Marin Keys community. There will also be some nighttime lighting on navigational aids, which is necessary for marine safety and to light the work areas on the booster pump station; although these new sources of lighting would not likely detract from nighttime views of San Pablo Bay, the potential new sources of glare resulting from reflection off the booster pump station and other dredging equipment is considered potentially significant. To minimize or eliminate glare impacts from the booster pump station on sunny days, USACE and Conservancy shall implement **Mitigation Measure AE-MM-2**. With implementation of this mitigation measure, the potential light and glare impact of Alternative 4 is considered ***less than significant***.

Mitigation Measure AE-MM-2: Shield Booster Station to Reduce Daytime Glare. To minimize effects of reflected light from the booster pump station, USACE and Conservancy shall either locate or shield the station so as to minimize or eliminate reflective glare on the residents of the Bel Marin Keys community.

Section 4.15

Greenhouse Gas Emissions and Climate Change

4.15.1 Methodology for Impact Analysis

The proposed ATF would have distinct periods of short-term construction and long-term operations activities and associated impacts. Short-term construction activities associated with the proposed action include transport of construction materials to the study site, pile driving, and initial dredging activities to construct an off-loader, excavate the proposed ATF basin and access channel and driving sheet pile in one alternative, or excavation of a BMKV basin and a direct channel. Long-term operations of an off-loader, an ATF, or the BMKV basin are still considered construction activities of the HWRP. Long-term ATF operations include ongoing placement of dredged material, redredging the ATF basin, and the transfer of the dredged material to the restoration site. The transfer of dredged materials to the HWRP site under the proposed action or alternative is expected to be completed in 9 to 18 years, depending on the alternative.

These short-term construction activities and long-term operational activities involve the direct emissions of greenhouse gases (GHGs) (primarily carbon dioxide [CO_2]) and the indirect emission of GHGs through the consumption of electricity (which results in GHG emissions at the power plant) for electric equipment. Emissions of GHGs are analyzed in terms of contribution to cumulative global GHGs.

As discussed in Section 3.15, increased GHGs globally would result in acceleration of global climate change and the associated impacts to the physical environment in California and to the planet including, but not limited to, rising temperatures; sea level rise; changes in agricultural growing conditions; changes in storm intensity and frequency; changes in water supply conditions; and changes in distribution of plant and wildlife species due to changes in temperature, competition from colonizing species, changes in hydrologic cycles, changes in sea levels, and other climate-related effects.

Diesel combustion results in emissions of CO_2, nitrous oxide (N_2O) and methane (CH_4), all of which are GHGs. However the emissions of CH_4 and N_2O from diesel combustion are a very small fraction of the emissions of CO_2 even when accounting for the different global warming potential of N_2O and CH_4 compared to CO_2. A recent GHG inventory for the Port of Los Angeles Channel Deepening Project found that N_2O and CH_4 emissions accounted for well less than 1% of total GHG emissions for construction of the action alternatives studied, even when accounting for the different global warming potentials (USACE and the Los Angeles Harbor Department 2008). Thus, the amount of N_2O and CH_4 emissions associated with diesel combustion for this project was not estimated because it would not materially alter the analysis or conclusions of the analysis. However, N_2O and CH_4 emissions associated with indirect GHG emissions associated with electricity consumption were included in the analysis below. All totals are expressed in carbon dioxide equivalent (CO_2e), which takes into account differences in global warming potentials of different GHGs, as discussed in Section 3.15.

4.15.1.1 Baseline Emissions

Baseline emissions were calculated to determine emissions associated with the No Action Alternative (Alternative 1). Comparing emissions from each proposed alternative to baseline emissions would determine overall net change in emissions associated with implementation of the action. The baseline condition for this project is the use of a diesel-powered off-loader facility during transfer of dredged materials from the transportation vessel to the restoration sites. Although Alternative 1 could be implemented with either a diesel- or electrically powered off-loader, using the diesel-powered off-loader as the baseline represents maximum emissions conditions. The baseline is presented for both construction and operation activities.

4.15.1.2 Project Emissions

An estimate of GHG emissions was prepared for all four action alternatives. GHG emissions were estimated for project construction and operations. Direct GHG emissions were estimated for diesel-powered construction and operation equipment and indirect GHG emissions were estimated for use of electricity due to power generation emissions. The methodology is described in Appendix F of this document.

4.15.2 Thresholds of Significance

CEQA Threshold

To date, there is no guidance and no local, regional, state, or federal regulations to establish a threshold of significance to determine the project-specific impacts of GHG emissions on global warming. In addition, the BAAQMD has not established such a threshold. Therefore, Conservancy is using the following as its CEQA threshold of significance for purpose of this analysis:

- *The Proposed Action would result in a significant CEQA impact if greenhouse gas emissions exceed CEQA Baseline emissions*.

The CEQA baseline is defined as the HWRP with an offloader operating under diesel power, as this has been previously approved and authorized by USACE and Conservancy.

NEPA Impacts

USACE has established the following position under NEPA. There are no established or widely accepted project-level significance thresholds, nor has the federal government adopted any by regulations. In the absence of an adopted standard, the USACE will not use the CEQA threshold being utilized by the Conservancy, propose a new GHG standard, or make a NEPA significance determination for GHG emissions anticipated to result from any of the alternatives of the Proposed Action. Rather, in compliance with the NEPA implementing regulations, the anticipated emissions relative to the baseline will be disclosed for each alternative of the proposed action without expressing a judgment as to their significance.

4.15.3 Impacts and Mitigation Measures

Table 4.15-1 summarizes the potential construction- and operation-related GHG emission impacts and subsequent CEQA significance determinations for each of the alternatives. The impact analysis follows below Table 4.15-1.

Table 4.15-1. Summary of Climate Change Impacts

Impacts	**Alternative 1: Dredged Material Off-loader facility (No Action)**	**Alternative 2: Unconfined In-Bay ATF (Proposed Action)**	**Alternative 3: Confined In-Bay ATF**	**Alternative 4: Direct Channel to BMKV Basin**
Impact CC-1: Project-related GHG Emissions	Less than Significant	Less than Significant	Less than Significant	Less than Significant

Impact CC-1—Greenhouse Gas Emissions (Less than Considerable over Baseline)

Currently, EPA, ARB, and BAAQMD have not established any thresholds or guidance to evaluate impacts associated with GHG emissions. As previously noted in Section 3.15, GHG contaminant emissions tend to accumulate in the atmosphere because of their relatively long lifespan. As a result, their impact to the atmosphere is mostly independent of the point of emission; GHG contaminant emissions are more appropriately evaluated on a regional, state, or even national scale than on an individual project level. However, as the project could contribute to GHG emissions, the potential emissions generated by the project have been evaluated.

Construction and Operations Emissions

Construction and operational emissions are summarized in Table 4.15-2 by alternative.

Table 4.15-2. Summary of Greenhouse Gas Emissions (tons CO_2e)

Alternative	Sediment Volume (cy)	CO_2e
Alternative 1. Dredged Material Off-loader (Baseline)		
Installation of piles for platform (pile driving)		1,105
Installation of off-loader		397
Installation of transfer pipeline, and power cable		781
Existing off-loader operations during construction		3,862
Decommissioning of existing off-loader		397
Restoration activities during construction (HWRP)		1,116
Construction subtotal		*8,634*
Average annual operations	1,200,000	7,657
Operation subtotal, including restoration (18 yrs)	*22,000,000*	*176,959*
Total (with construction and restoration, 18 years)		**184,616**
Alternative 2. Unconfined In-Bay ATF (Proposed Action)		
Dredging of ATF basin and access channel	1,811,000	13,680
Installation of infrastructure, pipeline, and power cable		808
Existing off-loader operations during construction		3,862
Decommissioning of existing off-loader		397
Restoration activities during construction (HWRP)		1,116
Construction subtotal		*19,864*
Average annual operations	2,018,000	9,199
Operation subtotal, including restoration (10 years)	*20,189,000*	*101,856*
Total (with construction and restoration, 10 years)		**121,720**
Alternative 3. Confined In-Bay ATF (Proposed Action)		
Dredging of ATF basin	1,811,000	13,680
Installation of sheet piles		1,023
Installation of pipeline and power cable		350
Existing off-loader operations during construction		3,862
Decommissioning of existing off-loader		397
Restoration activities during construction (HWRP)		1,116
Construction subtotal		*20,429*
Average annual operations	2,018,000	9,199
Operation subtotal, including restoration (10 years)	*20,189,000*	*101,856*
Total (with construction and restoration, 10 years)		**122,285**
Alternative 4. Direct Channel to BMKV-Basin		
Initial excavation of basin	1,260,300	15,561
Dredging of access channel and basin	2,412,400	18,691
Installation of transfer pipeline and power cable		65
Existing off-loader operations during construction		3,862
Decommissioning of existing off-loader		397
Restoration activities during construction (HWRP)		1,116
Construction subtotal		*39,692*
Average annual operations	2,036,000	9,199
Operation subtotal, including restoration (9 years)	*18,327,300*	*92,404*
Total (with construction and restoration, 9 years)		**132,096**

HWRP Tidal Wetland Restoration Changes in Carbon Sink Values

For all alternatives, the HWRP will result in a net increase of carbon sequestration due to the creation of tidal wetlands and other wetlands, compared to the existing land covers (agricultural hay fields and agricultural ponded areas, grasslands, freshwater wetlands, brackish open water and developed areas) at the HWRP site.

The estimation of the net GHG flux related to land use changes is subject to numerous uncertainties and thus an exact accounting of the change in GHG emissions for the HWRP related to land use changes was not prepared. However, a review of the literature on land use changes would support a conclusion that the HWRP site will, in the long run, result in less GHG emissions than without the HWRP as a whole.

Under existing conditions, GHG emissions related to the prior use of the 2,576 acres of agricultural fields and fallow land include the fossil fuel emissions associated with plowing, harvesting, and transport of crop and the balance of soil carbon in hay fields, grasslands, and wetland soils. A review of literature sources indicated a wide range of estimates and uncertainties in estimating the annual carbon flux for agricultural fields and grasslands, with some studies (Baker et al. 2007;, Mikhailova et al. 2000) suggesting similar soil carbon values for perennial hay fields and grasslands. Over time, croplands tend to have stable (Houghton 2007) or declining levels of soil organic carbon (Conant et al. 2007). Thus, it is likely that existing croplands on the site is, at best, neutral in terms of soil carbon flux on an annual basis but may actually be a net source of carbon emissions from fossil fuel combustion in farm equipment. Noncultivated grasslands have more stable amounts of soil carbon than croplands and are thought to be relatively neutral on an annual basis (i.e., neither a net sink nor source of CO_2) (Houghton 2007). Tidal wetlands are likely net sequesters of carbon (Chmura et al. 2002; Trulio 2007; Houghton 2007) and thus, on an annual basis, where restored tidal wetlands replace croplands or fallow grassland, an increase in net annual sequestration of carbon is expected.

HWRP also contains areas of seasonal freshwater wetlands, open water ponds, and ditches. Freshwater wetlands are a net carbon sink due to the sequestration of soil carbon with some broad estimates of an annual sink value of 0.2 tons CO_2/year/acre (Houghton 2007) but also a net source of CH_4 (due to decay of organic matter). On a broad basis, freshwater wetlands are possibly neutral in terms of GHG flux on an annual basis (Bridgham et al. 2007). Ponds and ditches are expected to similarly sequester carbon while releasing CH_4methane like freshwater wetlands. As discussed below, tidal wetlands are thought to have negligible CH_4 emissions. Replacement of freshwater wetlands, open-water ponds, and ditches with tidal wetlands would likely reduce CH_4 emissions substantially while still providing net sequestration of soil carbon.

According to several literature sources and reviews (Chmura et al. 2002; Trulio 2007; Houghton 2007) tidal wetlands are a substantial net GHG sink. Rough estimates of the carbon sink value for tidal wetlands range are equivalent to 3.0 to 3.4 tons CO_2/year/acre (Chmura et al. 2002; Houghton 2007). Bay area studies (Trulio 2007) show an estimate carbon sink value for tidal wetlands equivalent to 0.8 tons to 4.6 tons CO_2/year/acre; using these values the tidal wetland restoration could correspond to a sink of about 1,100 to 6,400 (median value of 3,800) metric tons of CO_2/year. CH_4 and N_2O emissions are thought to be negligible in tidal saline wetland soils. Assuming that the 2,526 acres of hay field, grasslands, freshwater wetlands, open-water ponds, ditches, and developed land is, at best, neither a source nor a sink of GHG emissions based on the considerations above, the restoration of tidal wetlands in this area would result in the creation of a substantial net sink that could range from about 1,100 to 6,400 metric tons of CO_2 per year.

As noted above, estimating GHG emission changes associated with land use change is subject to numerous uncertainties and the analysis above is somewhat speculative and broad in nature and should only be considered for illustrative purposes. Further, this analysis has excluded other GHG emission sources and sinks for both the existing setting and the project conditions including, fossil fuel emissions for transport of crops; fossil fuel emissions of future recreational visitors to the site; and changes in absolute biomass stock levels between today's condition versus tidal marsh vegetation with the project. Nevertheless, given the likely character of the tidal wetland area as a carbon sink and the likely existing character of the site as either neutral or possibly a net source of GHG emissions, the project is not in the long run expected to increase GHG emissions overall, nor contribute to a cumulative increase in GHG emissions. The evidence suggests instead that the HWRP will actually reduce GHG emissions relative to without HWRP conditions.

Alternative 1: Dredged Material Off-Loader Facility (No Action)

Construction and operational CO_2e emissions are indicated above in Table 4.15-2 and total 185,000 tons of CO_2 (including onshore restoration activity). Using this estimate, the HWRP upon wetland maturity with Alternative 1 would offset the construction emissions in approximately 30 to 160 years (depending on the sink value of tidal wetlands created) with a median estimate of 50 years. This is the baseline condition.

Because the project will eventually offset its contribution of GHG emissions, under CEQA, this is considered a ***less than significant*** impact and a ***less than considerable*** contribution to cumulative GHG emissions and associated climate change impacts.

Alternative 2: Unconfined In-Bay ATF (Proposed Action), Alternative 3: Confined In-Bay ATF, and Alternative 4: Direct Channel to BMKV Basin

Alternatives 2–4 would result in a net decrease in GHG emissions overall compared to baseline conditions.

Construction and operational CO_2 emissions are indicated above in Tables 4.15-2 and range from 122,000 (Alternatives 2 and 3) to 132,000 (Alternative 4) tons of CO_2e (including onshore restoration activity). The action alternative would result in between 52,000 (Alternative 4) and 63,000 (Alternative 2) less tons of GHG emissions compared to Alternative 1 baseline conditions.

Using these estimates, the HWRP upon wetland maturity with Alternative 2 or 3 would offset the construction emissions in approximately 20 to 110 years (depending on the sink value of tidal wetlands created) with a median estimate of 32 years. Alternative 4 would take slightly longer to offset construction emissions due to higher construction emissions.

As these alternatives would lower GHG emissions relative to the baseline condition and because in time, the project will eventually offset its contribution of GHG emissions, under CEQA this is considered a ***less than significant*** impact and a ***less than considerable*** contribution to cumulative GHG emissions and associated climate change impacts.

Chapter 5
Other Required Analyses

This chapter addresses other required analyses for the proposed ATF and alternatives, as required by NEPA and CEQA, including cumulative impacts, irreversible and irretrievable commitments of resources, and the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity.

For a comparison of project-level significant conclusions for all environmental impacts across the four alternatives, see Table ES-1 in the *Executive Summary*.

5.1 Cumulative Impacts

The Council on Environmental Quality's NEPA regulations (40 Code of Federal Regulations [CFR] 1580.25) and State CEQA Guidelines (Section 15130) require a reasonable analysis of the significant cumulative impacts of a proposed project[1]. An impact is defined as an effect causing a change in conditions. This change can be beneficial or adverse. Cumulative impact refers to "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts."

5.1.1 Approach to Cumulative Impact Analysis

The scope of analysis for this section includes all federal and non-federal dredging projects in San Francisco Bay, projects that have the potential to resuspend sediments or release constituents of concern in San Pablo Bay, other wetland restoration projects in the Bay Area, and other current or reasonably foreseeable projects occurring within and/or directly affecting the western San Pablo Bay.

Methodology used to develop the cumulative impact analysis includes the following:

- developing a list of past, present, and reasonably foreseeable future projects in the vicinity of the project area (Table 5-1, following page);
- reviewing planning and environmental documents associated with the list of past, present, and reasonably foreseeable future projects;
- reviewing comments and concerns expressed by the public addressing any potential cumulative impacts that may occur as the result of this project (see Appendix H);
- qualitatively evaluating the potential contribution of the proposed ATF to cumulative impacts.

[1]For the purposes of the cumulative impact anaysis, the term *project* used in this SEIR/EIS refers explicitly to the term as defined under CEQ's regulations for NEPA and the State CEQA Guidelines: "the entirety of an action which has a potential for resulting in a physical change in the environment." USACE defines *project* as "an action that has been authorized by Congress," such as the HWRP.

Table 5-1. Past, Present, and Reasonably Foreseeable Projects Reviewed for Evaluation of Cumulative Impacts

Project	Document(s) Reviewed
Hamilton Wetlands Restoration Project (2,524 acres [ac])	Hamilton Wetlands Restoration Plan Final EIS/EIR (USACE 1998) and Bel Marin Keys Unit V Supplemental EIS/EIR (USACE 2003)
Dredging and dredged material disposal in San Francisco Bay, including dredging at Port of Oakland, Port of Richmond, San Pablo Bay Across the Flats Channel (i.e., Petaluma River channel), Port of Redwood City, Pinole Shoal Channel, etc. and disposal at SF-8, SF-9, SF-10, SF-11, SF-16, and SF-DODS [Deep Ocean Disposal Site]	Long Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region Final EIS/EIR (USACE et al. 1998) Oakland Harbor Navigation Improvement (50-Foot) Project Final EIR/EIS (USACE and Port of Oakland 1998a)
Napa River Salt Marsh Restoration Project (9,460 ac)	Napa River Salt Marsh Restoration Project Final EIS (Jones & Stokes 2004)
Sonoma Baylands Wetland Demonstration Project (320 ac)	Cooperative Conservation Case Study of the Sonoma Baylands Wetland Demonstration Project (USACE 2008); Project of the Sonoma Baylands Wetland Demonstration Project Summary (USACE 1998)
Sears Point Wetland and Watershed Restoration Project (1,000 ac)	Notice of Preparation to Prepare an Environmental Impact Statement/Report for the Sears Point Wetland and Watershed Restoration Project (Jones & Stokes 2008)
Montezuma Wetlands Restoration Project (1,800 ac)	Montezuma Wetlands Project Draft EIS/EIR (USACE et al. 1994)
Cullinan Ranch Restoration Project (1,564 ac)	Notice of Intent to prepare an Environmental Impact Statement (U.S. Fish and Wildlife Service [USFWS] 2007)
Tolay Creek Restoration Project (305 ac)	Request for Proposal to Construct (Ducks Unlimited et al.1997)
San Francisco Water Transit Authority Expansion	Expansion of Ferry Transit Service in the San Francisco Bay Area Final Program EIR (URS Corporation 2003)
Trans-Bay Cable	Final EIR for the Trans Bay Cable Project (URS Corporation 2006)
San Francisco Bay Trail	San Francisco Bay Trail Plan (Association of Bay Area Governments 1989)
Dredging in the Sacramento-San Joaquin Delta including Stockton Deep Water Channel, Sacramento River Deep Water Channel, and John Baldwin Channel	LTMS for Delta Sediments (USACE, under development)
Marin County General Plan	The Marin Countywide Plan (Marin County 1994)
Contra Costa County General Plan	Contra Costa General Plan 2005–2020 (Contra Costa County 2005)
City of Novato General Plan	City of Novato General Plan (City of Novato 1996)

This cumulative impact analysis timeline covers the estimated 9 to 18 years needed for construction, operation, maintenance, and decommission of the proposed ATF or alternative (see Chapter 2, *Description of Alternatives*).

It is assumed that “short-term” construction-related impacts for the proposed project will occur during the approximately 1 to 6 month project construction window. “Long-term” operational impacts are expected to persist for the estimated 9 to 18 year project timeline, depending on the alternative selected. Although long-term operational impacts would average 9 to 18 years in duration, depending on the alternative selected, these potential impacts to San Pablo Bay resources are not expected to persist beyond construction of the project. It is assumed that once decommissioned, the proposed alternative footprints would return to surrounding conditions and no longer have any impact on San Pablo Bay. The BMKV basin would be converted from agriculture land back to wetlands regardless of the alternative selected. Is it assumed the beneficial cumulative impact of this project is to return the project area to its original status as wetlands. Finally, the proposed project is a component of the HWRP. Implementation of the proposed action would accelerate establishment of this restoration project and would allow achievement of the Long-Term Management Strategy (LTMS) goals.

While the overall scale of the cumulative impact analysis includes all of the greater San Francisco Bay wherein dredging and disposal is conducted, the specific geographic scale of analysis for each subject varies depending on the potential to affect resources in common between the proposed action and the other cumulative projects and actions. The specific scale of analysis is noted under each subject accordingly.

5.1.2 Geology, Soils, and Seismicity

The geographic scope of analysis for cumulative effects on geology, soils, and seismicity related effects is San Pablo Bay as the project’s geological effects are limited to San Pablo Bay.

There is potential for adverse cumulative impacts on geology, soils, and seismicity should regional development patterns place people or structures in areas at risk for geologic hazards (e.g., surface fault rupture, groundshaking, liquefaction, landslides, seiche, ground settlement, or expansive soils). According to site-specific geotechnical investigations, there are no active faults, potentially active faults, or Alquist-Priolo Earthquake Fault Zones located in, or immediately adjacent to, the project area. However, due to proximity of faults in the region, it is possible the area could experience seismic movement. Artificially filled areas are at greatest risk of ground shaking and failure during seismic events.

Although Alternative 1 may be subject to strong ground motions and liquefaction surrounding the pile structure securing the facility, this would be an isolated structure and is considered a less-than-significant contribution to any cumulative geologic impacts to the area of San Pablo Bay.

Alternatives 2 and 3 may be subject to liquefaction along the ATF basin slopes and Alternative 4 may be subject to liquefaction along the direct channel slopes, but this is not expected to contribute to any cumulative geologic impacts to the area of San Pablo Bay. Should liquefaction occur, there would be no risk of personal injury, loss of life, and/or damage to property. Additionally, all proposed structures under each alternative would be designed in accordance with the most current and appropriate California Building Code standards to ensure that potential damage is minimized during an earthquake or settlement event.

Existing and reasonably foreseeable projects considered for this cumulative impacts analysis are either considered existing baseline conditions (i.e. existing O&M dredging projects) or would not result in permanent structures in San Pablo Bay (such as construction of a bridge). As such, the proposed alternatives and other reasonably foreseeable projects are expected to result in a less-than-significant cumulative impact on geology, soils, and seismicity in and around San Pablo Bay.

5.1.3 Circulation and Sedimentation

The geographic scope of analysis for cumulative effects on circulation and sedimentation was San Francisco Bay (and the ocean area of SF-8 and DODS) because the project alternatives would alter the placement of dredged material throughout San Francisco Bay and at the two ocean sites when material is diverted for reuse at the HWRP.

There is a potential for adverse cumulative impacts on circulation and sedimentation resulting from implementation of the proposed alternatives if combined with possible impacts resulting from existing or reasonably foreseeable projects in such a way as to cause significant changes to tidal flows, sediment transport, or erosion and deposition in San Pablo Bay or the greater San Francisco Bay.

Alternatives 1, 2, and 4 would have limited effects on circulation in San Pablo Bay and would not contribute to any cumulative circulation impact. Due to the presence of the confining walls, Alternative 3 is expected to have the greatest adverse impact on circulation during operation. As discussed in Section 4.3, currents would be diverted around the confining wall, resulting in the formation of a well-defined wake zone downstream of the ATF basin (MacWilliams and Cheng 2007). Cumulative projects, such as the wetland restoration projects around San Pablo Bay could also alter circulation in areas where existing levees are breached; however these projects would alter circulation along tributaries to San Pablo Bay and in nearshore areas in contrast to the location of the ATF in Alternative 3. Thus, although the circulation impacts of Alternative 3 are significant and unavoidable, they would not contribute to a cumulatively significant circulation impact.

Construction of Alternative 1 could result in increased suspended sediment that would resettle in other parts of San Pablo Bay due to pile-driving for the booster pump platform and/or off-loader facility, and installation of the dredged material delivery pipeline. However, any construction related resuspended sediments would be localized and temporary (during construction); their contribution to a cumulative impact on circulation and sedimentation is considered less than significant. Similar to Alternative 1, construction of Alternatives 2, 3, and 4 could resuspend sediments in the localized area during excavation of basins and channels and installation of the transfer pipeline. Construction of Alternative 3 would also require pile-driving approximately 125 piles for installation of the confining wall, which could also resuspend sediments. Cumulative projects would also result in suspension of additional sediment during the same time as the proposed project, however their impacts would also be localized and given existing high levels of suspended sediment, a significant cumulative effect is not expected.

As San Pablo Bay is currently erosional, projects that would remove additional sediment from the bay (e.g., dredging projects that place dredged material at SF-DODS or at other upland sites) could result in a potentially significant cumulative adverse impact on the sediment budget. Implementation of any of the alternatives involves redirecting approximately 1.2 to 1.6 mcy of dredged material annually from disposal at in-Bay and ocean disposal sites for restoration at the HWRP site. As discussed in Section 4.3, *Circulation and Sedimentation*, the proposed project and the alternatives would only alter a small portion of the sediment budget of the different embayments of the greater San Francisco Bay, including San Pablo Bay. Past, present, and reasonably foreseeable future projects, including other wetland restoration activities around San Pablo Bay (including Sonoma Baylands, Napa River Salt Marsh, Sears Point, and Cullinan Ranch) will also result in increased sediment demand during the development of the HWRP.

Although there is a potential to cumulatively alter the sediment budget, it is important to note that longer-scale phenomena are likely far more influential than the alterations resultant from the HWRP project or the other wetland restoration projects. Two key influences are the historic changes in sediment inputs from upstream and sea level rise. San Pablo Bay and other parts of greater San Francisco Bay were heavily influenced by massive inputs of sediment during the hydraulic mining period of the late nineteenth century. It is possible that the current erosional state of San Pablo Bay at present is a continuing adjustment toward a new dynamic equilibrium following the elimination of hydraulic mining. In addition, sea level has been rising throughout the last and present century and is likely being accelerated due to the influence of climate change. Sea level is thus also contributing to the erosion of fringing tidal mudflat and marsh. While the influence of these landscape-level forces on the erosional state of San Pablo Bay has not been quantified, it is considered likely that they may be more influential than the changes that would occur with the HWRP and the other wetland restoration projects.

While there is a potential that the changes in sediment demand could exacerbate current erosion of tidal mudflats and fringing marshes, the potential losses these due to increases in erosion would be more than compensated through the creation of thousands of acres of new tidal wetlands, mudflats, and open water habitat as a result of the cumulative restoration projects being implemented in San Pablo Bay and elsewhere in the greater San Francisco Bay. Thus, overall, the cumulative effect on the sediment budget (and the project's contribution to this effect) is considered less than significant.

5.1.4 Water and Sediment Quality

The geographic scope of analysis for cumulative effects on water and sediment quality was San Francisco Bay (and the ocean area of SF-8 and DODS) because the project alternatives would alter the placement of dredged material throughout San Francisco Bay and at the two ocean sites when material is diverted for reuse at the HWRP.

There is a potential for adverse cumulative impacts on water quality should projects occurring in San Pablo Bay release constituents of concern into the water column, create potential for methylmercury formation, resuspend sediments, or adversely impact other water quality parameters (e.g., dissolved oxygen and nutrient concentrations). Constituents of concern that are of particular interest in San Pablo Bay are listed on the Clean Water Act (CWA) Section 303(d) list for impaired water bodies and include: Chlordane, Dichloro-Diphenyl-Trichloroethane (DDT), Dieldrin, Dioxin Compounds, Exotic Species, Furan Compounds, Mercury, Nickel, polychlorinated biphenyls (PCBs), and Selenium. Other projects with the potential to increase adverse cumulative impacts on water quality are mostly dredging/disposal projects (both federal and non-federal). During the 9 to 18 year life of the alternatives (depending on the selected alternative), some channels, ports, and marinas may be deepened (the Port of Oakland -50-Foot Improvement Project, Stockton Deep Water Ship Channel) and existing projects maintained (there are 14 federal navigation projects and approximately 93 private navigation projects in San Francisco Bay).

Alternative 1 could increase the risk for release of constituents of concern and resuspend sediments during construction of the facility platform, booster pump platform, and dredged material delivery pipeline. However, any releases would be temporary (occurring only during construction and maintenance of the structures) and localized. Alternatives 2, 3, and 4 could also increase the risk of release of constituents of concern or cause methylmercury formation during construction excavation of the ATF basin and access channel, installation of the transfer pipeline and pump station (Alternatives 2 and 3), and construction of the direct channel to BMKV basin (Alternative 4). As previously discussed, sedimentation modeling suggests that a Hydraulic Mining Debris layer could exist in the footprint of the ATF basin. Excavation of this layer could release mercury to waters of San Pablo Bay. With mitigation measures described in Section 4.4, *Potential Impacts to Water and Sediment Quality*, impacts of the project or the alternatives on water quality are considered less than significant. Other cumulative projects could also affect water quality in San Pablo Bay during the period of construction of the proposed project or the alternatives. However, similar to the proposed project, their effects on water quality are expected to be localized. As none of the cumulative projects is located in the immediate vicinity of the HWRP or the associated facilities with the proposed project or alternatives, no cumulative water quality during construction is expected.

Operation of Alternative 1 would not involve placing dredged material in San Pablo Bay and thus would only have limited water quality effects in the Bay but there may be water quality challenges in managing large amounts of water at the HWRP. Operation of Alternatives 2 and 3 would result in dredged material being placed in an ATF basin in San Pablo Bay waters for beneficial use at the HWRP site. During placement, sediments and associated constituents of concern could be released into the water column but with mitigation, the effects on water quality are considered limited and ultimately less than significant. Alternative 4 would result in dredged material transport scows and tugs traversing a 23,000-foot-long, -17 foot mean lower low water (MLLW) direct channel in San Pablo Bay and placing dredged material in the BMKV basin. During transport and placement of dredged material there is the potential for sediments and associated constituents of concern along the direct channel and in the scows to be resuspended in San Pablo Bay waters. Other cumulative projects could also affect water quality in San Pablo Bay during the period of operation of the proposed project or the alternatives. However, similar to the proposed project, their effects on water quality are expected to be localized. As none of the cumulative projects is located in the immediate vicinity of the HWRP or the associated facilities with the proposed project or alternatives, no cumulative water quality during operation is expected.

At this time dredged materials which are not beneficially used, are placed at other in-Bay or off-shore disposal sites. Operationally, all alternatives would result in a reduction of dredge material being disposed at dispersive sites throughout the greater San Francisco Bay. The three action alternatives would result in 400,000 cy of sediment less (than with Alternative 1) annually being deposited at dispersive in-Bay and ocean disposal sites and thus avoid associated water quality effects. Present and reasonable foreseeable projects in the area such as HWRP and other regional beneficial use projects have the potential to have a substantially beneficial impact on water quality in the greater San Francisco Bay by minimizing material volumes placed at the existing in-Bay disposal sites.

5.1.5 Marine and Terrestrial Biological Resources

The geographic region of analysis for biological resources varies depending on the type of organism based on their mobility, normal movement, and population range. Past, present, and reasonable foreseeable projects that have the potential to contribute to cumulative impacts related to marine biology have the potential to occur are projects such as dredging and disposal activities, as well as restoration activities in San Pablo Bay and elsewhere in the greater San Francisco Bay. Thus, the cumulative geographic region of analysis for marine biological resources in the Greater San Francisco Bay due to the changes in dredged material placement with the projects.

Adverse cumulative impacts related to terrestrial biology could occur where development and construction activities affect terrestrial species, including waterfowl and seabirds that utilize tidal and open water habitats. The project and its alternatives would only affect terrestrial species on a small portion of the BMKV site; as no other projects are proposed on this site, no cumulative effects on terrestrial biological resources is identified.

Alternative 1 may potentially cause temporary adverse impacts to aquatic habitat in San Pablo Bay during both project construction and operation. A small area of subtidal habitat (2.1 ac) and mudflat (<0.1 ac) would be temporarily disturbed due to pipeline installation (during replacement, repair or maintenance activities), and subtidal habitat quality may be temporarily degraded due to shading effects of the facility. Due to the limited area disturbed by Alternative 1 and the implementation of mitigation measures MTB-MM-2, MTB-MM-3, MTB-MM-5 and MTB-MM-6, the adverse cumulative impacts to biological resources is considered less than significant.

Alternatives 2 through 4 would have the potential for substantially greater adverse impacts to aquatic habitat in San Pablo Bay due to increased dredging during construction and O&M of the ATF basin (Alternatives 2 and 3) and the direct channel (Alternative 4). Both mudflat habitat and subtidal habitat would be temporarily disturbed in Alternatives 2 through 4, and water quality would be temporarily degraded during periodic mobilization of sediment at the ATF basin (Alternatives 2 and 3) and the direct channel (Alternative 4). Implementation of the mitigation measures MTB-MM-1 through MTB-MM-6 would reduce some of these impacts to acceptable levels.

However, the following are considerable contributions to adverse cumulative biological resources impacts: entrainment of green sturgeon during dredging related to Alternatives 2, 3 and 4; entrainment of listed and common fish species during dredging and propeller strikes for fish species related to Alternative 4, mortality and/or harassment of listed fish and marine mammal immediately adjacent to pile driving activities in Alternative 3; temporary loss/disturbance of up to 243 ac of subtidal habitat in Alternative 4, respectively.

As previously discussed, there is limited information on green sturgeon distribution and movement in San Francisco Bay. As such, the LTMS agencies are conducting green sturgeon tagging studies to develop an understanding of the spatial and temporal distribution and movement of green sturgeon in San Francisco Bay. As part of the proposed project, USACE will consult and coordinate with NOAA Fisheries prior to construction and operation of any action alternative to install acoustic monitors in the general area of the ATF basin and for any potential effects on green sturgeon. Should the tagging studies indicate that green sturgeon are attracted to the site, USACE will develop measures in consultation with NOAA Fisheries to further reduce any potential entrainment impacts on green sturgeon.

Cumulative projects that occur within subtidal and tidal habitats could also result in temporary loss or disturbance of aquatic habitats and may also affect special status species which are affected by the proposed project or its alternatives.

The proposed ATF or the other action alternatives would facilitate and potentially accelerate the restoration of the HWRP compared to the approved off-loader by completing the HWRP in 10 years versus 18 years with the off-loader.

The result of the tidal wetland restoration projects around San Pablo Bay (HWRP, Sonoma Baylands, Sears Point, Montezuma, Tolay Creek, Cullinan Ranch, and Napa River Salt Marsh) will be a substantial increase in the amount and value of tidal wetlands and intertidal habitats throughout the Bay, resulting in a beneficial cumulative impact. Current and planned restoration projects total over 17,000 ac of habitat for fish, marine mammal, and seabird species. Restoration effort, facilitated by projects such as the HWRP, will result in greater habitat complexity, diversity, and productivity in tidal marsh throughout San Pablo Bay. While implementation of the proposed action may have temporary adverse cumulative effect on specific biological resources, the long term cumulative effects on marine and terrestrial biological resources are expected to be beneficial as the project would allow for accelerated construction of the HWRP which is one of the largest wetland restoration projects currently underway in San Francisco Bay.

5.1.6 Environmental Justice, Population, and Housing

The geographic scope of analysis for cumulative effects on environmental justice is San Pablo Bay and immediately adjacent areas as the project and alternative's potential effects are limited to San Pablo Bay.

Cumulative adverse impacts related to environmental justice, population, and housing could occur where development patterns would result in population displacement or disproportionate adverse impacts to disadvantaged communities. None of the four alternatives would contribute to an adverse cumulative impact on population or housing, since they would not require the permanent or temporary acquisition of populated land or housing units, and would not displace people or housing. Operation of the four alternatives would generate few new USACE or contractor employees and no new housing units, so contributions to regional growth would be negligible.

Alternative 1, the existing dredged material facility, has not had a disproportional adverse impact to disadvantaged communities since the likelihood of increased contamination and associated health risks to environmental justice communities reliant on subsistence fishing in San Pablo Bay is minimal. All dredged material received by the facility would meet water quality criteria for use at a wetlands restoration site (i.e., incoming dredged material would not contain elevated levels of mercury). Additionally, Alternative 1 has low potential to remobilize mercury into the water column since disposal materials would be transferred directly from scows to the dredged material pipeline. Alternative 1 results in a less-than-significant contribution to an adverse cumulative impact.

Alternatives 2 and 3 have the potential to temporarily increase mercury concentrations levels in a small, localized area due to the initial excavation of the ATF basin and construction of the pipeline, as well as disturbance of sediments during placement and reuptake of material at the ATF basin site. However, with mitigation identified in Section 4.4, *Potential Impacts to Water and Sediment Quality*, impacts of these alternatives relative to methylmercury formation (and potential uptake in recreationally fished species) are considered less-than-considerable contributions to a cumulative impact.

Alternative 4 would have comparable, but potentially greater adverse impacts than Alternatives 2 and 3 due to excavation and maintenance of the 22,300-foot-long direct channel. However, a Sediment

Sampling and Analysis Plan (SAP) will be prepared to test materials for possible contamination, including mercury levels elevated beyond ambient levels. Excavation and disposal best management practices to protect water and sediment quality would also be implemented.

The Dredged Materials and Management Office (DMMO) requires all concurrent construction of regional wetlands restoration projects (HWRP, Sonoma Baylands, Sears Point, Montezuma, Tolay Creek, Cullinan Ranch, and Napa River Salt Marsh) and other in-Bay construction projects (such as the Oakland Harbor -50-Foot Deepening and the TransBay Cable) to prepare an SAP for sediment testing to meet specific standards for mercury and other potential constituents of concern. Considered in combination with these other projects, none of the alternatives is anticipated to contribute to an adverse cumulative environmental justice impact.

5.1.7 Cultural Resources

There is potential for cumulative adverse impacts related to cultural resources to occur should excavation or construction activities uncover buried historical, archaeological, or paleontological resources.

5.1.7.1 Historic Properties

The initial literature review and research of existing maps and records searches indicated that there are no recorded cultural resources within the project areas of any of the project alternatives. There are shipwrecks reported being located in San Pablo Bay, and thus the project areas have the potential to include this type of cultural resource. Additional studies to identify submerged historic maritime cultural resources prior to project implementation are therefore proposed (see reference below).

At this time, the Alternative 1 project area and adjacent vicinity do not contain recorded cultural resources. Although presence for recorded cultural resources are not identified within the impact areas of Alternatives 2, 3, and 4, it is possible to encounter remains of shipwrecks in locations that are still unconfirmed. Because Alternatives 2 and 3 (ATF basin excavation), and Alternative 4 (direct channel excavation) would have greater bay-floor disturbance, there is more potential for adverse cumulative impacts on maritime cultural resources than with Alternative 1.

5.1.7.2 Paleontological Resources

The bay mud underlying the locations of the off-loader facility and in-line booster facilities in Alternative 1 is considered highly sensitive for paleontological resources. Construction activities associated with pile driving to secure the off-loader facility and booster would disturb the bay mud, but the extent of Alternative 1 disturbance would be very limited compared to the other alternatives. The foreseeable adverse cumulative impact on paleontological resources appears to be less than significant.

Construction activities under Alternative 2, 3, and 4 could damage the stratigraphic context of microfossil remains, and thus the proposed ATF, when combined with other Bay construction projects identified in Table 5-1, may disturb important information on the region’s environmental history. However, on the scale of San Pablo Bay, these disturbances are but a small fraction of the overall strata present. Much of San Pablo Bay is not disturbed by the presence of development, dredging, pipelines or other structural intrusions that have altered the underlying subsurface geological strata and the potential fossil material present there. Thus, regardless of which alternative is implemented, there will be extensive areas open for future paleontological study of the history of the San Francisco Bay depression. The foreseeable adverse cumulative impact on the stratigraphic context of microfossil remains appears to be less than significant.

Due to the potential for the ATF alternatives to identify, and possibly impact cultural resources, and in conjunction with other Bay projects that have uncovered shipwreck features, there would be an adverse cumulative impact to this resource category. The degree of impact, however, becomes less than significant when mitigation measures are implemented.

As noted in *Section 4.7 Cultural Resources*, USACE and Conservancy would be required to conduct further geospatial and remote sensing investigations as part of the mitigation program. With this mitigation, the estimated contribution by Alternatives 2 through 4 to adverse cumulative impacts associated with damage or loss of cultural and paleontological resources in the San Pablo Bay region is less than significant.

5.1.8 Land Use

The geographic scope of analysis for cumulative effects on land use is San Pablo Bay and adjacent parts of Marin County and Contra Costa County as the project and alternatives' potential to affect land uses is limited to San Pablo Bay and the immediately adjacent areas.

Cumulative impacts related to land use could occur where regional development patterns conflict with local and regional plans, programs, and policies.

Alternative 1 is the existing dredged material facility located entirely within the waters of San Pablo Bay, from the vicinity of SF-10 across mudflats to the edge of the BMKV site. The facility and associated transfer pipeline and booster pump facility is compatible with existing land uses, city and county general plans, and applicable policies of the San Francisco Bay Plan and LTMS Management Plan. Alternative 1 results in a less-than-significant contribution to adverse cumulative land use impacts.

Construction of Alternatives 2 and 3, including ATF basin and associated transfer pipeline, is compatible with existing land uses, city and county general plans, and applicable policies of the San Francisco Bay Plan and LTMS Management Plan. There are no other plans for the use of the land utilized by the project or the HWRP as a whole. The estimated contribution of Alternatives 2 and 3 to cumulative adverse impacts on land use and planning are thus less than significant.

Alternative 4, on the other hand, conflicts with some local and regional policies. Alternative 4 would result in substantial direct and indirect unavoidable adverse impacts to existing aquatic habitats (shallow bay and tidal mudflat) in San Pablo Bay, and would therefore conflict with multiple city and county General Plan and Bay Plan policies that intend to protect such habitats from degradation.

As with the proposed project and alternatives, the regional wetlands restoration projects (HWRP, Sonoma Baylands, Sears Point, Montezuma, Tolay Creek, Cullinan Ranch, and Napa River Salt Marsh) and other in-Bay construction projects (such as the Oakland Harbor -50-Foot Deepening and the TransBay Cable) are required to comply with local and regional plans and policies. Alternative 4 conflicts with several land use policies and has the potential to contribute to a significant adverse cumulative impact if other projects' activities are also found to be inconsistent with the intent and guidance of local and regional agencies.

5.1.9 Recreation and Commercial Fishing

The geographic scope of analysis for cumulative effects on recreation and commercial fishing is San Pablo Bay and adjacent parts of Marin County and Contra Costa County as the project and alternatives' potential to effect recreation and commercial fishing is limited to San Pablo Bay and the immediately adjacent areas.

There is the potential for adverse cumulative impacts related to recreation where dredging, restoration or other activities significantly affect recreational and commercial fishing, boating, or hunting on San Pablo Bay.

Due to the relatively minor footprint of the facility in the context of the entire San Pablo Bay, Alternative 1 would not have significant adverse impacts on recreational activities. Changes in access to prime fishing or hunting locations and changes in navigation patterns for recreational vessels would be minor. Recreational boating and fishing activities generally occur at the perimeter of San Pablo Bay and would therefore not directly conflict with Alternative 1 in the open bay waters adjacent to the Pinole Shoal deep water channel. The contribution of Alternative 1 to adverse cumulative recreational impacts on San Pablo Bay is considered less than significant.

Alternatives 2 and 3 would have comparable adverse impacts to fishing or hunting access and changes in navigation patterns for recreational vessels as Alternative 1, due to their relatively minor footprint within San Pablo Bay. Direct conflicts would also not occur between recreational activities and Alternative 4 since recreational and fishing would be allowed within the direct channel, and there would only be minor changes regarding both the access and quality of the recreational resources of San Pablo Bay. Therefore, the adverse cumulative impacts for Alternatives 2 through 4 on recreational resources are considered less than significant.

Regional restoration efforts – facilitated by projects such as the HWRP – will result in beneficial cumulative impacts such as greater habitat complexity, diversity, and productivity in tidal marshes throughout San Pablo Bay. These habitat improvements will support populations of resident and migratory special status species. As a result, recreational fishing and hunting opportunities will likely improve over time, creating a beneficial cumulative impact to fishing and hunting.

5.1.10 Petroleum and Hazardous Materials

The geographic scope of analysis for cumulative effects on petroleum and hazardous materials is San Pablo Bay, Suisun Bay, and San Francisco Bay, as the project and alternatives' potential to effect the environment due to accidental spills could reach outside of San Pablo Bay depending on the specific upset conditions.

There is the potential for adverse cumulative impacts related to petroleum and hazardous materials, resulting from an accidental spill or leak by construction or operational equipment into San Pablo Bay waters.

The potential release of hazardous materials could occur during construction and operation of the facility, installation of the transfer pipeline, and idling of delivery vessels at the placement site in Alternative 1. However, implementation of the Environmental Protection Plan and adherence to all applicable regulatory programs and permits ensure that the contributions of Alternative 1 to adverse cumulative hazardous release are considered less than significant.

Potential release of hazardous materials could occur during construction of the ATF basin, installation of the transfer pipeline, and idling of delivery vessels at the placement site in Alternatives 2 and 3. In Alternative 4, release of hazardous materials could occur during excavation of the direct channel, construction of the BMKV basin and perimeter levees, and transit of delivery vessels up the direct channel. However, implementation of the Environmental Protection Plan and adherence to all applicable regulatory programs and permits would ensure that Alternatives 2, 3, and 4 do not constitute a potentially considerable hazardous release site. Therefore, the contributions by Alternatives 2, 3, and 4 to an adverse cumulative impact on petroleum and hazardous materials are considered less than significant.

Reestablishing tidal connectivity to the many regional wetlands restoration areas will result in hydrologic exchange between restored marshlands and waters of San Pablo Bay, possibly resulting in the deposition of contaminant-laden sediments. Accidental spills or leaks by construction or operational equipment associated with the restoration efforts, or other in-Bay construction projects (such as the Oakland Harbor -50-Foot Deepening and the TransBay Cable), would degrade water quality throughout the Bay. However, these regional projects are required to adhere to applicable regulatory programs and permits, and therefore reduce their individual impacts to a level that is not adversely cumulatively significant. Thus, the project would not contribute considerably to a significant cumulative impact.

As described below, Alternative 3 could result in a significant and unavoidable navigation hazard due to the presence of a 58-acre sheet pile exclusion that could contribute considerably to a risk of oil spill in San Pablo Bay.

5.1.11 Transportation and Marine Navigation

The geographic scope of analysis for cumulative effects on transportation and marine navigation is San Pablo Bay, Suisun Bay, and San Francisco Bay, as the project and alternatives' would change marine traffic patterns related to the transport of dredged material throughout the greater San Francisco Bay.

Potential adverse cumulative impacts related to transportation and marine navigation could occur where dredging, restoration and other activities significantly affect marine traffic patterns on San Pablo Bay.

In Alternative 1, the existing dredged material facility has increased vessel traffic at the facility site. However, Alternative 1 does not increase the number of vessels delivering dredged material throughout San Francisco Bay, but redirects deliveries to the project site from existing in-Bay disposal sites. With implementation of the mitigation measures outlined in Section 4.11, *Transportation and Marine Navigation,* cumulative adverse impacts on transportation and marine navigation by Alternative 1 are considered less than significant.

The three action alternatives would also concentrate vessel traffic and congestion in and around the project site: in San Pablo Bay at the ATF basin (Alternatives 2 and 3), or at the mouth of the direct channel (Alternative 4). Increased local activity would result from initial construction and from the delivery of dredged material to the site by scows and barges. Comparable to Alternative 1, Alternatives 2 through 4 would not increase the number of vessels delivering dredged material throughout San Francisco Bay, but instead would redirect deliveries to the proposed project sites from other disposal sites. With implementation of the mitigation measures outlined in Section 4.11, *Transportation and Marine Navigation,* cumulative adverse impacts on marine traffic from Alternatives 2 through 4 are considered less than significant.

Alternatives 1 and 2 would also create a temporary obstruction to navigation routes for small vessels in the Bay due to an off-loader in Alternative 1 and a floating booster pump station within the open waters of San Pablo Bay for both alternatives. Although these alternatives have the potential for transportation hazards, all facilities would contain navigation lights and aids. With implementation of mitigation measures outlined in Section 4.11, *Transportation and Marine Navigation,* potential adverse impacts are considered less than significant for Alternatives 1 and 2.

Alternative 3 would create a 58-ac confinement area that would be inaccessible to non-project vessels. Alternative 3 with its sheetpile walls and location adjacent to the deepwater navigation channel, still poses a potential navigational hazard even with implementation of identified mitigation measures. Although the adverse impact of Alternative 3 on navigation is individually significant and unavoidable, it is not expected to contribute to an adverse cumulative impact on marine navigation as none of the identified cumulative projects is expected to contribute considerably to a cumulative impact.

Vessel traffic associated with other in-Bay dredging and construction projects (including all federal and non-federal O&M dredging projects, the Oakland Harbor -50-Foot Deepening, and the TransBay Cable) could result in potential transportation and marine navigation hazards. However, regional projects will comply with U.S. Coast Guard and other navigation regulations, and therefore reduce their individual adverse impacts to a level that is not cumulatively significant. Furthermore, despite other planned activities in San Pablo Bay, the project would not result in a net increase of vessel traffic. Considering the overall size of San Pablo Bay, and the limited nature of the proposed activities, the contribution by Alternatives 1 through 4 to adverse cumulative impacts on transportation and marine navigation are considered less than considerable.

5.1.12 Air Quality

The geographic scope of analysis for cumulative effects on air quality is the San Francisco Bay Area Basin because the project and alternatives' potential to effect air quality could affect regional air quality. Cumulative impacts related to greenhouse gas emissions and climate change are discussed separately in Section 4.15, *Greenhouse Gas Emissions and Climate Change*.

The potential for adverse cumulative impacts related to air quality could occur where construction and operation activities increase criteria pollutant emissions above local, state, and federal standards. The Bay Area Air Quality Management District's (BAAQMD's) approach for assessing cumulative impacts is based on the air quality management plan (AQMP) forecast of attainment of ambient air quality standards in accordance with the requirements of the federal and state Clean Air Acts. The AQMP is intended to bring the Basin into attainment for all criteria pollutants (BAAQMD 2006). All alternatives would implement emission control measures to ensure that emissions of criteria pollutants do not exceed *de minimis* thresholds. As a result, the adverse cumulative impact to regional air quality from the emission of criteria pollutant is considered less than significant for all alternatives. Adverse cumulative impacts related to odor emissions could occur where construction and operation activities increase the impacts to regional sensitive receptors. However, the proposed action and its alternatives will be located at substantial distance from potential receptors and thus would not result in significant odor impacts.

Other cumulative projects will also result in criteria and toxic pollutants and other emissions and may also result in odors. However, all projects are required to comply with the applicable federal and state air quality requirements concerning criteria and toxic air pollutants. Regarding odor, none of the cumulative projects would result in odors in direct proximity to the proposed project.

Thus, the project or its alternatives would not contribute considerably to cumulatively significant impacts when considering the impacts of cumulative projects.

5.1.13 Noise

The geographic scope of analysis for cumulative noise effects is San Pablo Bay and adjacent parts of Marin County and Contra Costa County as the project and alternatives' potential to effect noise is limited to San Pablo Bay and the immediately adjacent areas.

Adverse impacts related to noise could occur where Bay development and construction activities increase noise levels above local, state, and federal standards.

Alternative 1 already exists and is operational. If the facility needed to be replaced, it would result in an increase in noise in the immediate project vicinity only during construction. Construction and operation of the facility would occur in open San Pablo Bay waters, more than 1.5 miles (mi) from the nearest recreational receptor. The transfer pipeline and booster pumps are over 1 mi from the nearest Bel Marin Keys residence (at the nearest point to shore); therefore, construction and operational noise from these facilities is attenuated before reaching sensitive receptors. The contribution of Alternative 1 to an adverse cumulative noise impact is considered less than significant.

Construction and operation of Alternatives 2 through 4 would result in a comparable increase in noise in the immediate project vicinity. However, sensitive receptors are located over 1.5 mi or further from the study area of Alternatives 2 and 3, and would thus not be impacted.

Similarly, sensitive receptors are far enough from the study area of Alternative 4 (over 1.0 mi from the nearest Bel Marin Keys residence) such that construction noise would attenuate to below threshold levels, and would thus not cause an adverse impact. However, the operation of booster pumps and a maintenance dredge at the BMKV basin in Alternative 4 has the potential to exceed the nighttime noise threshold for adjacent residents. With implementation of the mitigation measure outlined in Section 4.13, *Noise,* any potential contribution by Alternative 4 to adverse cumulative noise impacts is considered less than significant. Noise impacts related to fish, wildlife, and bird species are addressed in Section 4.5, *Marine and Terrestrial Biology*.

As with the proposed project and alternatives, the regional wetlands restoration projects (HWRP, Sonoma Baylands, Sears Point, Montezuma, Tolay Creek, Cullinan Ranch, and Napa River Salt Marsh) and other in-Bay construction projects (such as the Oakland Harbor -50-Foot Deepening and the TransBay Cable) will all create construction-related noise. However, none of these projects are located in areas to contribute noise to the same receptors potentially affected by the proposed project or its alternatives. Thus, the proposed project or its alternatives would not contribute considerably to a significant cumulative noise impact when taking into account cumulative projects.

5.1.14 Aesthetics

The geographic scope of analysis for cumulative effects on aesthetics is San Pablo Bay and adjacent parts of Marin County and Contra Costa County as the project and alternatives' potential to affect aesthetics is limited to San Pablo Bay and the immediately adjacent areas.

Adverse impacts related to aesthetics could occur where regional development patterns affect scenic vistas and overall visual quality on San Pablo Bay. Alternative 1, the existing dredged material facility, does not have significant adverse aesthetic impacts. The facility platform is compatible with the existing visual quality of San Pablo Bay since its maritime history includes a diverse range of marine, industrial, commercial, and shipping facilities and activities. Furthermore, given the existing character of the viewsheds and sweeping expanses of open water, project activities and facilities comprise a minor structure within or on the shore of the Bay. The cumulative adverse aesthetic impact from Alternative 1 is less than significant.

Installation of ATF facilities under Alternative 2 would have limited to no effect on visual aesthetics as only limited visible facilities would be installed in San Pablo Bay. In Alternative 3, the sheet pile enclosure would have a significant impact on visual aesthetics and light and glare, but after implementation of mitigation included in Section 4.14, *Aesthetics*, the impact is considered less than significant.

The installation of a new perimeter levee and hydraulic cutterhead dredge and pump station at the BMKV basin in Alternative 4 would alter scenic views from the Bel Marin Keys community of the BMKV parcel itself. The new levee and other facilities would not alter views of San Pablo Bay as they would be located nearly a mile from the community and the levee would be a similar height to the existing outboard levee. In addition, HWRP construction activity would already be occurring in areas closer to the community and would in part interrupt views of the BMKV basin activity. However, the booster pump station and other dredging equipment necessary to support the transfer of dredged materials at the Alternative 4 BMKV basin may create reflection on sunny days. With implementation of the mitigation measure outlined in Section 4.14, *Aesthetics*, this impact is considered less than significant. Therefore, the adverse cumulative aesthetic impact from Alternative 4 is considered less than significant.

None of the other cumulative projects propose visible structures in the same areas as the visible structures associated with the project or its alternatives. Implementation of the regional wetlands restoration projects may have adverse, short-term construction related aesthetics impacts as wetlands elevations and topographic features are installed using dredges, bulldozers, trucks, and other large machinery but these impacts will be localize to each individual project site, which is not in proximity to the proposed project. With completion of cumulative wetland restoration projects, the edges of San Pablo Bay would be restored to tidal habitats, which many would consider an aesthetic cumulative benefit.

Overall, the proposed project or the alternatives would not contribute considerably to a cumulatively significant impact on aesthetics, when considering the effects of the cumulative projects.

5.2 Significant and Unavoidable Impacts

For the proposed project and alternatives, there are several significant adverse impacts that proposed mitigation may not mitigate to a less-than-significant level.

Alternative 1

There are no significant unavoidable impacts with Alternative 1 with implementation of mitigation identified in Chapter 4.

Alternative 2

- **Impact MTB-1: Entrainment in Dredge Equipment during Construction Excavation, Maintenance Dredging and Operational Dredged Material Removal**. Under Alternative 2, it is expected that larval, juvenile, and adult fish species present within the entrainment field of the cutterhead dredge may not be able to escape and may be drawn into the cutterhead action of the dredge. The level to which sturgeon could be present in the project area and whether or not they are attracted to construction, maintenance, or operational dredging activities is uncertain. Moreover, sturgeon are year-round species in San Pablo Bay and no environmental work window currently exists for them.

Alternative 3

- **Impact MTB-1: Entrainment in Dredge Equipment during Construction Excavation, Maintenance Dredging and Operational Dredged Material Removal**. Under Alternative 3 and 3, it is expected that larval, juvenile, and adult fish species present within the entrainment field of the cutterhead dredge may not be able to escape and may be drawn into the cutterhead action of the dredge. The level to which sturgeon could be present in the project area and whether or not they are attracted to construction, maintenance, or operational dredging activities is uncertain. Moreover, sturgeon are year-round species in San Pablo Bay and no environmental work window currently exists for them.
- **Impact MTB-6: Impacts to Aquatic Organisms Resulting from Pile-Driving Generated Noise.** Pile driving would be required for the booster pump and ATF confinement walls. A relatively smaller area around the area of the confinement walls is where there would be potential for affects to fish, marine mammals, and sea dwelling birds. Implementation of mitigation measures would reduce these impacts. However, even with mitigation, there is the potential for direct harm or harassment to fish, marine mammals, and birds adjacent to pile-driving activity.
- **Impact TMN-1 Hazard and Safety to Boaters and Disruption to Vessel Traffic**. Alternative 3 could pose a navigational hazard to non-project based vessels, especially in inclement weather resulting vessel collisions or crashes with the ATF facilities and potential damage to both the ATF confinement wall and the tanker or cargo vessel and possibly cause oil or cargo to spill into San Pablo Bay. In the rare and unlikely event of a major oil spill as a result of a collision with the

ATF, there would be significant and unavoidable impacts to San Pablo Bay, the greater San Francisco Bay, and coastal areas.

Alternative 4

- **Impact MTB-1: Entrainment in Dredge Equipment during Construction Excavation, Maintenance Dredging and Operational Dredged Material Removal**. Under Alternative 4, it is expected that larval, juvenile, and adult fish species present within the entrainment field of the cutterhead dredge may not be able to escape and may be drawn into the cutterhead action of the dredge. The level to which sturgeon could be present in the project area and whether or not they are attracted to construction, maintenance, or operational dredging activities is uncertain. Moreover, sturgeon are year-round species in San Pablo Bay and no environmental work window currently exists for them. There is also potential for entrainment during low tide and the potential for fish to be attracted to the deeper channel, thus entrainment of fish and some benthic species is unavoidable.

- **Impact MB-3: Mortality or Injury of Marine Mammals, Special-Status Fish Species, Common Fish Species, Waterfowl, and Water Birds, Including Seabirds, Resulting from Entrainment or Smothering from Dredged Material Placement**. Construction vessels and tug/scow combinations used to transport dredged material to the BMKV basin could collide, strike with their propellers, and/or entrain in prop wash fish that may be present in the direct channel footprint or BMKV basin during construction and operation of Alternative 4. Possible confinement of fish species in the direct channel and BMKV basin during low tide could increase the number of collisions and propeller strikes, leading to unavoidable impacts on constrained fish.

- **Impact MTB-4: Impacts to Aquatic Organisms Resulting from Contact with Resuspended Sediment Plumes. -** Fish using the direct channel or within the basin could be subject to resuspended sediments generated from vessel traffic or dredged material placement, respectively, especially in the direct channel during low tide. Implementation of mitigation measures would reduce this impact to juvenile salmonids and other species with LTMS environmental windows; however, there are no environmental windows for green sturgeon, Dungeness crab, and other aquatic species.

- **Impact MB-7: Loss of Intertidal, Mudflat, and Marsh Habitats and Associated Foraging, Spawning, Rearing, and Migration Habitats.** Construction of Alternative 4 would result in disturbance to approximately 243 ac (disturbance to 233 ac of subtidal and shallow waters and direct loss of 10 ac of mudflat habitat) that would be maintained for the 9-year life of the project (this represents 0.36% of San Pablo Bay's aquatic habitat). During operation and maintenance of the direct channel, fish species confined in the channel during low tide could experience reduced foraging, spawning, and/or migration success. It is expected that individuals trapped in the direct channel would be able to continue these biological functions once the flood tide returns, or they could experience overall reduced fitness and/or mortality. Although implementation of mitigation measures could reduce the impact for some species (green sturgeon and other year-round species do not have environmental work windows designated), the behavioral responses of individuals is rather speculative and, as such, this impact could be unavoidable.

- **Impact MTB-13: Temporary Loss (9 Years) of Foraging Habitat for Shorebirds during Construction, Maintenance, Operation, and Decommissioning.** In order to excavate a direct channel from San Pablo Bay to the BMKV site, approximately 4 to 10 ac of tidal mudflats would be removed for the duration of the 9-year project; however, no tidal salt marsh habitat would be removed. This could result in the removal of foraging habitat for shorebirds. While this loss is small relative to the available foraging habitat available in the region, tidal mudflats are considered a 'special aquatic site' by USACE (40 CFR 230.10(a)(3)). Due to the scale of mudflat loss under this alternative, this impact would be unavoidable.

- **Impact MTB-15: Disturbance to Bird Species due to Project-Related Noise.** Noise, vibration, visual, and proximity related disturbances associated with construction could disturb bird species that nest and forage in tidal flat and upland habitats, including special-status species such as the northern harrier, burrowing owl and San Pablo song sparrow. If these species are nesting on or adjacent to the site during the excavation of the BMKV basin, individuals could be displaced from foraging habitat, or nesting birds could abandon nests as the result of high noise levels or other project-related construction activity. This impact would be unavoidable under operational conditions as well because they would be localized around the BMKV basin from vessel transit, off-loading, and dredging.
- **Impact MTB-16: Short-term (9 Years) Loss and/or Degradation of Tidal Mudflat Habitat during Construction, Maintenance, Operation, and Decommissioning.** Alternative 4 would result in approximately 4 to 10 ac of tidal mudflat habitat removed during excavation of the direct channel from San Pablo Bay to the BMKV basin. The impacted area would return to mudflat once dredged material placement is complete. The loss of mudflat habitat would persist for the 9-year duration of this alternative and, therefore, would not necessarily be considered temporary. Newly established tidal mudflat habitat would not offset the losses accrued. Tidal mudflats are considered a 'special aquatic site' by USACE (40 CFR 230.10(a)(3)). These areas possess "special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values." As such, this scale of mudflat loss is considered unavoidable.
- **Impact LU-1: Consistency with Applicable County and City General Plan Policies.** This alternative would result in substantial direct and indirect impacts on wildlife and aquatic habitats in San Pablo Bay and would, therefore, conflict with the following city and county General Plan policy EQ-2.44, which is intended to protect such habitats from degradation.
- **Impact LU-2: Consistency with the San Francisco Bay Plan and/or LTMS Management Plan.** Because this alternative would result in substantial direct and indirect impacts on existing San Pablo Bay tidal mudflat habitats, it would conflict with multiple San Francisco Bay Plan policies that intend to protect such habitats from degradation, as well as the San Francisco Bay LTMS Management Plan policy addressing the location of rehandling facilities.

5.3 Irreversible and Irretrievable Commitment of Resources

Pursuant to NEPA (40 CFR 1502.16) and CEQA Guidelines (Section 15126.2(c)), an EIS/EIR shall discuss a project's irreversible environmental changes associated with the usage of nonrenewable resources during its construction and long-term operation. This section also requires a discussion of the project's irreversible changes related to potential environmental accidents.

The project would result in the irretrievable commitment of fossil fuels and other energy sources to build, operate, and maintain the proposed ATF or alternatives for the project timeframe (9 to 18 years). Activities associated with the project would consume petroleum products used to power many construction-related vehicles and pieces of machinery. Many of the materials used for facility structure, transfer pipeline, and booster pump stations would also be non-renewable. Once the project is completed, it would not contribute to any additional resource consumption.

Impact TMN-1 Navigation Hazard in Section 4.11, *Transportation and Marine Navigation*, mentions the rare and unlikely event of a major oil spill as a result of a collision with the sheet pile enclosure in Alternative 3. Although unlikely, were this to occur, there could be long-term and irreversible adverse effects to biological resources (i.e., green sturgeon) and other resources in San Pablo Bay and other parts of greater San Francisco Bay. As previously discussed, the LTMS agencies are conducting green sturgeon tagging studies to develop an understanding of the spatial and temporal distribution and movement of green sturgeon in San Francisco Bay, including installation of acoustic monitors in the general area of the ATF basin to record any potential effects on green sturgeon. Should the tagging studies indicate that green sturgeon are attracted to the site, USACE will develop measures in consultation with NOAA Fisheries to further reduce any potential entrainment impacts on green sturgeon.

5.4 Relationship between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Pursuant to NEPA (40 CFR 1502.16), an EIS must consider the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity.

Under past practices, the majority of Bay Area dredged material was being managed as a waste to be disposed of. The proposed project enables a shift – consistent with the San Francisco Bay LTMS Management Plan – from short-term, project-specific uses of the environment (i.e., dispersive aquatic disposal) to a long-term, beneficial use of dredged material that would provide for environmental restoration. Due to the nature of the project itself – a dredged material rehandling facility for beneficial use in tidal wetlands restoration – implementation of either Alternative 1: No Action or any one of the three action alternatives (Alternatives 2 through 4) would result in a long-term increase in beneficial use of dredged material.

Short-term uses of the environment that would occur with the proposed ATF or alternatives include impacts to marine mammals, fish, and seabird species, along with a temporary (9 to 18 years) loss of tidal mudflat, due to construction-related activities. Additionally, transfer of dredged material for beneficial use would generate short-term impacts including vessel traffic, changes in tidal flows, turbidity, noise, and air emissions associated with construction and operation of the rehandling facility.

However, in the long term, implementation of the proposed action would facilitate the restoration of the HWRP tidal wetlands, which are expected to be substantially more productive for both marine and terrestrial habitat and wildlife values. The long-term productivity of these wetlands restoration sites – facilitated by the proposed action – will support habitat for marsh-dependant birds and fish, contribute to water filtration, accommodate flood flows from adjacent uplands, and provide recreational opportunities for Bay Area residents.

Chapter 6
Scoping, Consultation, and Other Requirements

This chapter provides an overview of the scoping process, consultation, and other requirements for the proposed project, as well as describes the progress made in meeting those requirements.

6.1 Public Involvement and Scoping

The intent of both NEPA and CEQA is to establish opportunities for the public to review and comment on projects that may affect the environment. Both NEPA and CEQA provide for public participation through

- project scoping,
- publication of Notice of Intent (NOI) and Notice of Preparation (NOP),
- formal public review of environmental documents, and
- public hearings.

NEPA and CEQA also require that a final EIS/EIR include responses to all comments received from the public regarding the draft EIS/EIR. The following sections provide additional information on public involvement in the environmental review process.

6.1.1 Project Scoping

Scoping refers to the process used under both NEPA and CEQA to determine the focus and content of an EIS/EIR. Scoping identifies the range of project alternatives and mitigation measures to be analyzed in depth. Scoping is also helpful in establishing methods of assessment and selecting the environmental effects to be considered in detail. Tools used in the scoping of this SEIS/EIR included early public and interagency consultation, public scoping meetings, and publication of the NOI and NOP.

6.1.2 Notice of Intent and Notice of Preparation

The purpose of the NOI and NOP is to solicit participation in determining the scope of an EIS/EIR from responsible and coordinating federal, state, and local agencies and interested members of the public.

The USACE and the Conservancy formally initiated the scoping process for this SEIS/EIR in January 2005 by publishing the NOI in the *Federal Register* (January 18, 2005) in compliance with NEPA and by submitting the NOP to the California State Clearinghouse in compliance with CEQA. In addition, a notification letter was distributed to all interested agencies, organizations, and members of the public (705 copies). The public scoping period for this document closed on February 25, 2005.

6.1.3 Public Scoping Meeting

During the planning process, the lead agencies held a public meeting to introduce interested members of the public to the proposed project and solicit public input. The public meeting was held on January 26, 2005. The meeting provided the public with an opportunity to meet the project sponsors, review and discuss project goals and objectives, and discuss alternative transfer concepts and potential environmental issues. It served as a formal scoping meeting for the environmental compliance process. Public comments received at this meeting were recorded for consideration. In addition, participants were encouraged to submit written comments to the project sponsors during the public comment period. The Scoping Summary Report prepared to summarize public comments and concerns about the proposed project is included as Appendix H to this draft SEIS/EIR.

6.2 Distribution and Review of the Draft SEIS/EIR

The lead agencies will submit a NOA to the *Federal Register* and a NOC to the California State Clearinghouse and interested parties announcing the availability of this draft SEIS/EIR for a 45-day public review and comment period. The public review and comment period will be held from October 17, 2008 to December 1, 2008. During this period, state and federal regulatory agencies, local government agencies, and members of the public are encouraged to review the draft SEIS/EIR and submit comments on the document to the lead agencies.

Additionally, the lead agencies will hold a public meeting on November 12, 2008 at the USACE Bay Model Visitor Center in Sausalito, CA to solicit any verbal comments on this draft SEIS/EIR.

6.3 Final SEIS/EIR

Following the public review and comment period, the USACE and the Conservancy will collate and address all environmental comments received on the draft SEIS/EIR. Pursuant to CEQA and NEPA, the agencies will prepare responses to these comments and revise the draft SEIS/EIR where substantive comments require changes or refinements to the analysis. The comments on the draft SEIS/EIR and the responses to these comments will be presented in the *Responses to Comments* chapter of the final SEIS/EIR. Changes to the text of the draft SEIS/EIR will be noted in the Responses to Comments and made in the text of the final SEIS/EIR.

While CEQA requires incorporation of responses to comments in a final EIR and provision of those responses to commenting public agencies prior to certification of a final EIR, it does not require a formal public comment period on a final EIR. However, pursuant to NEPA, the lead agencies will circulate the final SEIS/EIR for a 30-day review and comment period prior to the certification and filing of a Record of Decision.

6.4 Scoping Summary

During the scoping period, 10 written comment letters were received and 16 members of the public spoke at the public meeting. Agency and public comments received by the Conservancy and the USACE during the scoping process have been assembled in a Scoping Summary Report, which is included as Appendix H. A previous scoping report prepared by the USACE, which includes the public notice, NOI from the *Federal Register*, full mailing list, and copies of comment letters, is also included in the Scoping Summary Report.

Key issues of public concern that were raised during the scoping process include the following:

- Noise generation from the transfer facility operations (impacts to both humans and fish).
- Potential for navigation safety issues, especially oil tanker movement through San Pablo Bay.
- Potential for odor, toxicity (heavy metals such as mercury), or air quality threat from the dredged material.
- Timeline for creation of tidal wetlands, based on operation of the various alternatives.
- Water circulation and sediment transport/siltation (increased turbidity) within San Pablo Bay.
- Entrainment of aquatic organisms during slurry of dredged material, and potential impacts of slurry pipeline to species that move along the bottom.
- Impacts to commercial and recreational fishing.
- Operational impacts (air quality, traffic, noise) from increased large vessel, truck, and train traffic, and other port equipment.
- Potential for removal of materials from San Pablo Bay floor to uncover ordnance and/or associated contaminants from Hamilton AFB activities.
- Loss of biodiversity, impacts to special-status species and sensitive natural communities, interference with the movement of biotic or terrestrial wildlife, and potential disturbance to bird nesting, rearing, and fledgling activities.
- Spread of non-native invasive species that might be contained in dredged material.
- Risk of failure of the confining structure (including emergency response measures).
- Visibility of the transfer facility.

6.5 Consultation and Requirements

6.5.1 Federal Endangered Species Act

The U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) administer the federal Endangered Species Act (ESA). The ESA maintains a list of threatened and endangered species and provides for substantial protection of the listed species through compliance with Sections 7 and 10 of the ESA. NMFS is responsible for the protection of marine mammals and fishes (including anadromous fishes); all other species are within USFWS jurisdiction. Through Section 7 or Section 10 of the ESA, USFWS and NMFS ensure that project activities do not result in jeopardy to listed species or adverse modification of critical habitat. Under Section 7 of the ESA, a federal agency must ensure that its actions do not jeopardize the continued existence of a listed species and must formally consult with USFWS and NMFS if the proposed project may affect a listed species under either agency's jurisdiction.

The federal lead agency must consult with USFWS and NMFS to assess the consequences of its actions and to determine whether formal consultation is warranted. Formal consultation is initiated by the project proponent upon submission of a written request for consultation and a biological assessment of the proposed project. If USFWS and NMFS conclude that the project is not likely to adversely affect a listed species, then the action may be carried out without further review under the ESA. If the action is likely to result in adverse impacts on a listed species, then USFWS and NMFS will prepare a biological opinion describing how the action will affect the listed species. The opinion will provide either a "jeopardy opinion" or an "incidental take opinion." A *jeopardy opinion* concludes that the proposed project would jeopardize the continued existence of a federally listed species or adversely modify critical habitat of a listed species. Under this finding, the biological opinion must suggest "reasonable and prudent alternatives" that would avoid a jeopardy result. If the proposed project would result in the take of a listed species, then an "incidental take statement" would be issued. In an *incidental take statement*, USFWS and NMFS must specify the allowable amount of take that may occur as a result of the action, and USFWS and NMFS must suggest mitigation measures that will reduce or avoid impacts and compensate for the take.

The USACE has already initiated formal consultation with USFWS and NMFS for both the authorized HWRP and the BMKV expansion to determine the scope of required consultation, identify species of concern, and develop an appropriate approach to addressing listed and proposed species as part of the Section 7 consultation. The Biological Opinion (BO) for the HWRP was prepared in 2001 and the BMKV amendment was prepared in September 2003.

For the proposed ATF, the USACE will reinitiate the HWRP/BMKV consultation and seek an amendment to the existing BO. On behalf of the USACE, Jones & Stokes requested a list of threatened, endangered, and candidate species in the project area. USFWS and NMFS responded with several lists of such species, which are included in Appendix E. Sections 3.5 and 4.5, *Marine and Terrestrial Biology*, describes the potential for listed, proposed, or other sensitive species to occur in the study area and be affected by the project alternatives.

6.6 National Historic Preservation Act

Federal involvement in the proposed transfer facility triggers the requirement to comply with National Historic Preservation Act (NHPA) Section 106. Compliance with Section 106 requires the USACE to inventory historic properties and evaluate the eligibility of those properties for listing in the NRHP. The effects of the proposed ATF on properties that may be eligible for listing or are already listed on the NRHP are being addressed during that process.

Section 4.7, *Cultural Resources*, describes the potential effects of the alternatives on cultural resources and identifies measures that may be necessary to avoid or reduce impacts on these resources. As presented in that section, the proposed project is not expected to result in any significant effects on identified cultural resources, and no NRHP listed eligible or potentially eligible resources would be affected. A Section 106 report will be prepared and will be submitted to the State Historic Preservation Office (SHPO) for review, as necessary to comply with consultation requirements.

6.7 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) requires equal consideration of wildlife resource values in federal water-resource project planning, approval, and implementation. Compliance with the equal consideration mandate requires: consultation between action agencies and wildlife agencies for measures necessary to conserve wildlife in project planning, construction, and operation; reporting by wildlife agencies on the effects of the project and its alternatives on wildlife resources and on measures recommended to conserve wildlife resources in connection with the project and its alternatives; full consideration by the action agencies of measures recommended to conserve wildlife resources, both with regard to the proposed project and its alternatives; and implementation of justifiable conservation measures.

The USACE, as federal lead, will initiate consultation with USFWS on the preparation of a Coordination Act Report (CAR) for the proposed ATF. It is expected that, with implementation of justifiable conservation measures, the proposed ATF will be in compliance with the FWCA.

6.8 Marine Protection, Research, and Sanctuaries Act

The Marine Protection, Research, and Sanctuaries Act (MPRSA) regulates the ocean dumping of waste, provides for a research program on ocean dumping, and provides for the designation and regulation of marine sanctuaries. Specifically, the act regulates the ocean dumping of all material beyond the territorial limit (3 miles from shore) and prevents or strictly limits dumping material that “would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities” (Department of Energy Office of Environmental Policy and Guidance 2002).

The MPRSA is applied to activities that would directly place or dump materials into the ocean. The proposed ATF does not involve any of those types of activities; rather, it facilitates beneficial use of dredged material within San Pablo Bay. The proposed project involves the use of an in-Bay facility that would transport dredged material for placement on two wetlands restoration sites (HWRP and BMKV sites). Therefore, the MPRSA is not applicable to the proposed project.

6.9 Anadromous Fish Conservation Act

The Anadromous Fish Conservation Act (AFCA) (16 U.S.C. 757a-757g; Pub. L. 89-304, as amended) authorizes NMFS (under delegated authority from the Secretary of Commerce and/or the Secretary of Interior) to enter into cooperative agreements to protect anadromous fishery resources and to conserve, develop, and enhance anadromous fisheries.

Pursuant to the agreements authorized under the AFCA, NMFS may (1) conduct investigations, engineering and biological surveys, and research; (2) carry out stream clearance activities; (3) undertake actions to facilitate the fishery resources and their free migration; (4) use fish hatcheries to accomplish the purposes of the act; (5) study and make recommendations regarding the development and management of streams and other bodies of water consistent with the intent of the act; (6) acquire lands or interest therein; (7) accept donations to be used for acquiring or managing lands or interests therein; and (8) administer such lands or interest therein in a manner consistent with the intent of the act. Following the collection of these data, NMFS makes recommendations pertaining to the elimination or reduction of polluting substances detrimental to fish and wildlife in interstate or navigable waterways (National Council for Science and Environment 2002).

The USACE will initiate consultation with NMFS regarding the proposed ATF and its potential effect on anadromous fishes known to occur within Novato Creek and San Pablo Bay. The USACE will implement the provisions of the AFCA as required by NMFS to comply with the AFCA.

6.10 Magnuson Fishery Conservation and Management Act

The Magnuson Fishery Conservation and Management Act (MFCMA) (16 U.S.C. 1801-1882; Pub. L. 94-265, amended) established eight Regional Fishery Management Councils and required these councils to prepare fishery management plans (FMPs) for those fisheries that they determine require active federal management. Part of the preparation of an FMP is to identify “essential fish habitat” for managed species. The MFCMA requires federal agencies to consult with NMFS to determine potential federal project effects on essential fish habitat (National Council for Science and Environment 2002).

The USACE will initiate consultation with NMFS regarding the proposed ATF and its potential effects on marine resources. The USACE will prepare an essential fish habitat assessment and submit it to NMFS for review in compliance with the MFCMA.

6.11 Executive Order 11988—Floodplain Management

Executive Order 11988, “Floodplain Management,” requires federal agencies to prepare floodplain assessments for proposed projects located in or affecting floodplains. An agency proposing to conduct an action in a floodplain must consider alternatives to avoid adverse effects and incompatible development in the floodplain. If the only practicable alternative involves siting in a floodplain, the agency must minimize potential harm to or development in the floodplain and explain why the action is proposed in the floodplain.

Section 4.3, *Circulation and Sedimentation*, describes the potential water circulation, erosion, and sedimentation impacts of the proposed project. Because the proposed facility would be located within the Bay, the site would be inundated by the tides and would not increase the potential for flooding on surrounding parcels.

6.12 Executive Order 11990—Protection of Wetlands

Executive Order 11990, “Protection of Wetlands,” requires federal agencies to prepare wetland assessments for projects located in or affecting wetlands. Agencies must avoid undertaking new construction in wetlands unless no practicable alternative is available and the proposed project includes all practicable measures to minimize harm to wetlands.

Section 4.5, *Marine and Terrestrial Biology*, describes potential impacts of the proposed transfer facility on biological resources within San Pablo Bay. No tidal salt marsh would be removed by the proposed project; however, a negligible amount of mudflat (0.07 acres) would be disturbed. By facilitating the creation of tidal wetlands at the HWRP and BMKV sites through beneficial use of dredged material, the end result would be a net benefit to the wetland ecosystems in San Pablo Bay.

6.13 Executive Order 12898—Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations," requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their actions on minorities and low-income populations and communities.

Section 4.15, *Population and Environmental Justice*, relates that no permanent or temporary residences are located within the in-Bay study site, and that no disproportionately high or adverse human health or environmental effects on minority or low-income populations have been identified.

6.14 Clean Water Act Section 404

CWA Section 404 regulates the discharge of dredged and fill material into waters of the United States. Because the USACE is the federal project proponent, a CWA Section 404 permit will not be obtained for the proposed ATF. However, the USACE will comply with the CWA Section 404(b)(1) guidelines for discharge of dredged or fill material to waters of the United States. The CWA Section 404(b)(1) Evaluation has been included as Appendix D to this draft SEIS/EIR.

6.15 Clean Water Act Section 401

Under the CWA, the state (as implemented by the relevant board) must issue or waive Section 401 Water Quality Certification for the project to be permitted under Section 404. Water Quality Certification requires the evaluation of water quality considerations associated with dredging or placement of fill materials into waters of the United States. Though the USACE will not obtain a 404 permit, it must obtain a 401 Water Quality Certification from the San Francisco Bay Regional Water Quality Control Board.

Chapter 7

List of Preparers and Distribution List

7.1 List of Preparers and Reviewers

7.1.1 U.S. Army Corps of Engineers

Fari Tabatabai	Chief, Environmental Planning Section A
Peter Mull	Project Manager
Cynthia Jo Fowler	Environmental Manager
Jessica Burton Evans	Environmental Manager
Eric Jolliffe	Environmental Planner
Robin Liffmann	Environmental Planner
Irene Lee	Environmental Planner
John Azeveda	Consulting Civil Engineer

7.1.2 California State Coastal Conservancy

Betsy Wilson	Project Manager
Tom Gandesbery	Project Manager
Eric Polson, P.E	Consulting Civil Engineer

7.1.3 San Francisco Bay Conservation and Development Commission

Steve Goldbeck	Coastal Program Manager
Brenda Goeden	Environmental Planner

7.1.4 ICF Jones & Stokes

Rich Walter	Principal Director
Seema Sairam	Project Manager

Rosalyn Stewart	Former Project Manager
Sandra Devoto	Environmental Justice Analyst
Scott Frazier	Soil Scientist/Geologist
Michael Murrell Stevenson	Former Project Manager Consulting Hydrologist/Water Quality Specialist
Megan Robinson	Hydrologist/Water Quality Specialist
Jill Sunahara	Hydrologist/Water Quality Specialist
Rick Oestman	Senior Fisheries Biologist
Matthew Jones	Senior Fisheries Biologist
Donna Maniscalco	Fisheries Biologist
Amanda Petel	Botanist
Troy Rahmig	Wildlife Biologist
Holly Shepley	Wildlife Biologist
Alisa Reynolds	Archaeologist/Cultural Resources Specialist
Michelle Jerman	Archaeologist/Cultural Resources Specialist
Andrew Martin	Environmental Specialist
Jasmin Mejia	Environmental Specialist
William Forney	Environmental Specialist
Shannon Hatcher	Air Quality/Noise Specialist
Tim Messick	Graphic Artist
John Durnan	Graphic Artist
Paul Glendening	GIS Analyst
Ken Cherry	Technical Editor
Brent Bouldin	Technical Editor
Jenelle Mountain-Castro	Publications Specialist
Keira Perkins	Publications Specialist

7.2 Distribution List for Draft SEIS/EIR

This draft SEIS/EIR was distributed to federal, state, and local agencies with jurisdictional authority, permit authority, or interest in the project. Notices of availability of this document were distributed to organizations and individuals located within close proximity to the project or that have been identified as potentially concerned or interested parties within the project area.

Table 7-1 provides a summary list of the agencies and organizations consulted during scoping for this SEIS/EIR.

7.2.1 Agencies Receiving Draft SEIR/EIS

7.2.1.1 Federal Agencies Receiving Draft SEIS/EIR

Center for Disease Control, National Center for Environmental Health

Federal Emergency Management Agency

National Marine Fisheries Service (also called NOAA Fisheries)

National Oceanic and Atmospheric Administration

U.S. Army

U.S. Army Corps of Engineers, Headquarters

U.S. Army Corps of Engineers, Sacramento District

U.S. Army Corps of Engineers, San Francisco District

U.S. Army, Base Realignment and Closure Environmental Office, Hamilton Army Airfield

U.S. Coast Guard

U.S. Department of Agriculture, Natural Resources Conservation Service

U.S. Department of Interior, Office of Environmental Policy and Compliance

U.S. Environmental Protection Agency, Headquarters

U.S. Environmental Protection Agency, Region IX

U.S. Fish and Wildlife Service

U.S. Navy

7.2.1.2 State Agencies Receiving Draft SEIS/EIR

Bay Area Air Quality Management District

California Department of Boating and Waterways

California Department of Fish and Game

California Department of Parks and Recreation, Office of Historic Preservation

California Department of Toxic Substances Control

California Department of Transportation

California Native American Heritage Commission

California Public Utilities Commission

California State Lands Commission

San Francisco Bay Development and Conservation Commission

San Francisco Regional Water Quality Control Board

State Coastal Conservancy

7.2.1.3 Local Agencies Receiving Draft SEIS/EIR

Association of Bay Area Governments, Bay Trail Project

Bel Marin Keys Community Services District

Bel Marin Keys Planning Advisory Board

City of Novato Community Development Department

City of Novato Engineering Department

City of Novato Parks and Recreation Commission

City of Petaluma Planning Department

City of San Rafael Planning Department

Las Gallinas Sanitation District

Marin County Community Development Agency

Marin County Flood Control and Water Conservation District

Marin County Open Space District

Marin County Resource Conservation District

Marin-Sonoma Mosquito and Vector Control District

North Marin Water District

Novato Sanitary District

Port of Oakland

Port of San Francisco

Sonoma County Permit and Resource Management Department

7.2.2 Organizations and Individuals Receiving Notice of Availability

Notices of availability of this draft SEIS/EIR were distributed to all other organizations and individuals listed in Table 7-1.

7.2.3 Libraries where Draft SEIS/EIR is Available

Printed copies of this draft SEIS/EIR are available for review at the following public libraries.

Marin Civic Center Library
3501 Civic Center Drive #427
San Rafael, CA 94903

Marin County Free Library – South Novato
476 Ignacio Blvd
Novato, CA 94949-6086

Novato Public Library
1720 Novato Blvd
Novato, CA 94947-3049

Petaluma Regional Library
100 Fairgrounds Dr.
Petaluma, CA 94952-3369

Sonoma County Central Library
3rd and E Street
Santa Rosa, CA 95402

7.2.4 Internet Availability

The Draft SEIS/EIR is also available on the USACE's and Conservancy's website for the Hamilton Wetlands Restoration Project, as follows: www.hamiltonwetlands.org

Table 7-1. Distribution List for the Notice of Availability

Agency or Organization
1. AAUW
2. Adams Broadwell Joseph and Cardoza
3. Aeolian Yacht Club
4. Air Force Sergeant's Association
5. Alameda County Board of Supervisors
6. Alameda County Central Labor Council
7. American Legion
8. AMG Land Company
9. Anchor
10. Arc Ecology
11. Argus Courier
12. Assemblywoman Aroner
13. Association of Bay Area Governments
14. *Aviator and Business*
15. Bahia Homeowners Association
16. Barkovitch and Yap, Inc.
17. Bay Area Air Quality Management District
18. Bay Area Council
19. Bay Dredging Action Coalition
20. Bay Planning Coalition
21. Bay Trails Committee
22. Bean Environmental
23. Bel Marin Keys Community Services District
24. Bel Marin Keys Parks Committee
25. Bel Marin Keys Planning Advisory Board
26. Benevolent and Protective Order of the Elks
27. Benicia Industries, Inc.
28. Benicia Marina
29. BFI
30. Bianchi, Paxton, Engel & Keegin
31. Black Point Environmental Association
32. Black Point Improvement Club
33. Bluewater Network
34. Bolinas Hearsay News
35. Brickyard Cove Marina
36. Brisbane Marina
37. Brobeck, Phleger & Harrison
38. Brusco Tug & Barge

Agency or Organization
39. CALFED
40. California Native Plant Society (CNPS) – Marin Chapter
41. California State Lands Commission
42. California Alliance For Jobs
43. California Association of Harbor Masters
44. California Coastal Conservancy
45. California Coastal Commission
46. California Department of Boating and Waterways
47. California Department of Finance/Resources Unit
48. California Department of Fish & Game
49. California Department of Fish & Game, BRAC/IR Team
50. California Department of Fish and Game – Environmental Services Division
51. California Department of Parks and Recreation, Office of Historic Preservation
52. California Department of Toxic Substance Control
53. California Department of Water Quality
54. California Department of Water Resources
55. California Dredging
56. California Library Association
57. California Marine Affairs & Navigation Conference
58. California Native American Heritage Commission
59. California Native Plant Society
60. California Public Utilities Commission
61. California Sport Fishing Protection Alliance
62. California State Assembly
63. California State Assembly, 16th District
64. California State Lands Commission
65. California State Senate
66. California Water Commission
67. California Water Resources Control Board
68. Caltrans
69. Caltrans District IV

Table 7-1. Distribution List for Notice of Availability for the HWRP ATF SEIS/EIR

Agency or Organization
70. Caltrans Planning
71. Caminzind Dredging
72. Canal Community Alliance
73. Cargill Salt Division
74. CASTROL
75. Catholic Youth Organization
76. Catholic Youth Organization – St. Vincent
77. Center for Marine Conservation
78. Central Coast Sustainable Fisheries Organizer
79. Central Coast Regional Water Quality Control Board
80. Central Labor Council of Alameda County
81. Chambers Cable
82. Chevron Products Company
83. China Camp State Park
84. Church of the Nazarene
85. Citizens Advisory Committee
86. Citizens Committee to Complete the Refuge
87. City & County of San Francisco Planning Department
88. City of Alameda
89. City of Alameda, Planning Department
90. City of Antioch
91. City of Benicia
92. City of Berkeley
93. City of Cotati
94. City of Emeryville
95. City of Foster City, Estero Municipal Improvement
96. City of Hercules
97. City of Novato
98. City of Novato City Council
99. City of Novato Community Development Department
100. City of Novato Engineering Department
101. City of Novato Parks and Recreation Commission
102. City of Novato Planning Commission
103. City of Petaluma
104. City of Petaluma Planning Department
105. City of Pinole
106. City of Pittsburg Municipal Marina
107. City of Redwood City
108. City of Richmond
109. City of San Diego
110. City of San Leandro
111. City of San Leandro Marina
112. City of San Pablo
113. City of San Rafael
114. City of San Rafael Planning Department
115. City of Santa Rosa Community Development
116. City of Sonoma Planning and Building Department
117. City of Vallejo
118. City of Vallejo, Economic Development Division.
119. Clipper Yacht Harbor
120. CMA, Inc.
121. *Coastal Post*
122. Communities for a Better Environment
123. Community Solutions
124. Conoco Philips
125. Consultant
126. Contra Costa County
127. Contra Costa County Water Agency
128. *Contra Costa Times*
129. Cooper Crane & Rigging – West. Dock
130. Corinthian Yacht Club
131. County of Contra Costa
132. County of Sonoma – Permit & Resource Management
133. Coyote Point Marina
134. CSW/Stuber Stroeh
135. DEEP
136. Del Monte Homeowners Association
137. Del Prado Realty Investors, Ltd.
138. Delta Protection Commission
139. Department of the Army – WES

Table 7-1. Distribution List for Notice of Availability for the HWRP ATF SEIS/EIR

Agency or Organization
140. Dolphin Swimming & Boating Club
141. Domingo Canyon Homeowners Association
142. Dominican College
143. Dutra & Company
144. Dutra Group
145. Earth Justice League
146. East Novato Neighborhood Association
147. *Econews*
148. Ecorp Consulting
149. Ecumenical Association of Housing
150. EFA West, Naval Facilities
151. EIP Associates
152. Emery Cove Marina Condominium Assoc., Inc.
153. Emeryville Shoreline Committee
154. Environmental Defense Fund
155. Environmental Forum of Marin
156. Environmental Law Division
157. ESA
158. *Estuary Newsletter*
159. Eugene Burger Management Group
160. Federal Aviation Administration
161. Federal Emergency Management Agency, Region IX
162. Federated Coast Miwok
163. Friends of Novato Creek
164. G. Fred Lee & Associates
165. Gahagan & Bryant Assoc.
166. Gahagan and Bryant Associates
167. Galilee Harbor Community
168. Garcia and Associates
169. GeoSea Consulting (Canada) Limited
170. GGBH&TD
171. Ghilotti Brothers, Inc.
172. Girl Scouts of America
173. Glen Cove Marina
174. Global Gardens Inc.
175. Golden Gate Audubon Society
176. Golden Gate Bridge District

Agency or Organization
177. Golden Gate Fishermen’s Association
178. Great Lakes Dredge & Dock Co.
179. Greenbrae Marina Prop. Owners Assoc.
180. Greenbriar Rowing Club, Marin Marina
181. GSA
182. Hamilton Elementary School
183. Hamilton Field Action Association
184. Hamilton Field Community Development Foundation
185. Hamilton MAB
186. Hamilton Real Estate Co.
187. Hamilton Re-Use Committee
188. Happy Hooker Sportfishing
189. Harding Lawson Associates
190. Hill Neighborhood Association
191. Hillside Park Homeowners Association
192. Hispanic Chamber of Commerce
193. Horizon Cable Television
194. Ignacio Rotary
195. ILWU
196. Indian Valley Association
197. Integrity in Natural Resources
198. IT Corporation
199. Jerrico
200. John F Kennedy Library, Vallejo
201. Kammen Hydrology and Engineering, Inc.
202. KCBS – AM 740
203. KFTY–TV 50
204. Kier Associates
205. Kiwanis Club of Novato
206. Knights of Columbus
207. KOFY–TV 20
208. KQED–FM 88.5
209. KTVU–TV 2
210. L. C. Lee Assoc.
211. Las Gallinas Sanitation District
212. League of Women Voters of Marin County
213. League of Women Voters of the Bay Area

Table 7-1. Distribution List for Notice of Availability for the HWRP ATF SEIS/EIR

Agency or Organization
214. Leventhal Assoc.
215. Levin Terminal
216. LFR Levine Fricke
217. Litpon and Assoc.
218. Loch Lomond Live Bait
219. Loch Lomond Marina
220. Los Robles Mobile Home Park Association
221. LSA Associates
222. Luria Glen Isaacson and Associates
223. LWV U.S. Fish & Wildlife Service
224. Lynwood Park Improvement Association
225. Manson Construction & Engineering Co.
226. MARAD
227. Margaret Todd Senior Center
228. Marin Audubon Society
229. Marin Bay Park Homeowners Association
230. Marin Civic Center Library
231. Marin Community College
232. Marin Conservation Corps
233. Marin Conservation League
234. Marin Consultant
235. Marin Council of Agencies
236. Marin County Air Response Instant Network
237. Marin County Auditors
238. Marin County Aviation Commission
239. Marin County Board of Supervisors
240. Marin County Community Development Agency
241. Marin County Conservation League
242. Marin County Council
243. Marin County Country Club Homeowners Association
244. Marin County Deputy
245. Marin County Flood Control and Water Conservation District
246. Marin County Foundation
247. Marin County Free Library South Novato
248. Marin County Horse Council
249. Marin County Land Company
250. Marin County Open Space District
251. Marin County Planning Commission
252. Marin County Resource Conservation District
253. Marin County Sierra Club
254. Marin County Transit District
255. Marin County, Board of Supervisors
256. Marin Independent Journal
257. Marin Municipal Water District
258. Marin Valley Homeowner's League
259. Marin Yacht Club
260. Marina Plaza Harbor
261. Marina Services of Vallejo
262. Marina Vista Improvement Club
263. Marinscope
264. Marin-Sonoma Mosquito and Vector Control District
265. Marstel Day
266. Martinez Marina
267. Mas Aqua
268. McClay Road Homeowners Association
269. McDonough, Holland & Allen
270. MEC
271. Metropolitan Transportation Commission
272. Michael Cheney Associates
273. Millard Dubose Trust
274. Mission Estates Homeowners Association
275. Moffatt & Nichol Engineers
276. Monterey Bay National Marine Sanctuary
277. National Oceanic and Atmospheric Administration, c/o EPA Region 9
278. National Oceanic and Atmospheric Administration, Coastal Resource Coordination Program
279. National Oceanic and Atmospheric Administration, Marine Sanctuaries
280. National Oceanic and Atmospheric Administration, National Marine Fisheries Service
281. National Trust for Historic Preservation
282. Naval Facilities Engineering Command

Table 7-1. Distribution List for Notice of Availability for the HWRP ATF SEIS/EIR

Agency or Organization
283. Naval Postgraduate School
284. Nave Brothers
285. Navy Engineering Field Activity West
286. NCCOSC RDTE D3601
287. No. California Marine Association
288. North Bay Transit Committee
289. North Marin County Homeowners Association
290. North Marin Water District
291. Northern California Marine Assoc.
292. Northern California Rugby Union
293. Northwest Hydraulics Consultants, Inc.
294. Northwest Information Center
295. NOS/OCRM/Coastal Programs Division
296. Novato Advance
297. Novato Bicycle Pedestrian Committee
298. Novato Chamber of Commerce
299. Novato Ecumenical Housing, Inc.
300. Novato Fire Protection District
301. Novato Heights Homeowners Association
302. Novato Historical Guild
303. Novato History Museum
304. Novato Host Lions Club
305. Novato Human Needs Center
306. Novato Public Library
307. Novato Rotary
308. Novato Sanitary District
309. Novato Unified School Dist
310. NUMMI
311. Oakland Tribune
312. Office of Congressman Pete Stark
313. Office of Congressman Tom Lantos
314. Office of Congresswoman Lynn Woolsey
315. Office of Congresswoman Nancy Pelosi
316. Office of Representative Tauscher
317. Office of Senator Barbara Boxer
318. Ohlone Audubon Society
319. Oyster Cove Marina, Inc.

Agency or Organization
320. Pacheco Villas Homeowners Association
321. Pacific Club Yacht Association
322. Pacific Coast Federation of Fishermen's Assoc.
323. Pacific EcoRisk
324. Pacific Merchant Shipping Assoc.
325. Pacific Sun
326. Pacific Union
327. Paradise Cay Homeowners Association
328. Parkhaven Homeowners Association
329. Partridge Knolls Homeowners Association
330. *Petaluma Post*
331. Petaluma Regional Library
332. Petaluma River Keepers
333. PG&E
334. PICYA
335. Pinole Library
336. Port of Oakland
337. Port of Redwood City
338. Port of Richmond
339. Port of San Francisco
340. Port of Stockton
341. Port Sonoma Marina
342. Prospect Place Homeowners Association
343. Pt. Reyes Bird Observatory
344. Pt. Reyes Light
345. Pt. San Pablo Yacht Harbor c/o Fast Lane, Inc.
346. RBF Consulting
347. Reorganized Church of Jesus
348. Richmond Main Library
349. Richmond Yacht Club
350. River Vista Homeowners Association
351. Romberg Tiburon Center
352. Ross Island Dredging
353. Rotary Club of Novato
354. Sacramento County
355. SAIC
356. Salt River Construction Company

Table 7-1. Distribution List for Notice of Availability for the HWRP ATF SEIS/EIR

Agency or Organization
357. San Andreas Place Homeowners Association
358. San Francisco Bar Pilots
359. San Francisco Bay Conservation & Development Commission
360. San Francisco BayKeeper
361. San Francisco *Chronicle*
362. San Francisco Estuary Institute
363. San Francisco Estuary Project
364. San Francisco International Airport
365. San Francisco Regional Water Quality Control Board
366. San Francisco Yacht Club
367. San Marin 10 Homeowners Association
368. San Marin Improvement Association
369. San Marin Valley Homeowners Association
370. San Pablo Library
371. *San Rafael News Pointer*
372. Santa Cruz Port District
373. *Santa Rosa Press Democrat*
374. Save Our Shores
375. Save San Francisco Bay Association
376. Schoonmaker Point Marina
377. Scottsdale Lake Homeowners Association
378. SF Bay Wetlands Institute
379. Shaw Environmental
380. Shea Homes
381. Shell Martinez Refining Company
382. Sheppard, Mullin, et al.
383. Sierra Club
384. Sierra Club, Loma Prieta Chapter
385. Sierra Club, Marin Group
386. Sierra Club, SF Bay Chapter
387. Simsmetal America
388. Solano County, Department of Environmental Management
389. Sonoma County Board of Supervisors
390. Sonoma County Central Library
391. Sonoma County Permit and Resource Management Department

Agency or Organization
392. Sonoma County Public Works Department
393. Sonoma Land Trust
394. Soroptimist International of Novato
395. South Novato Homeowners Association
396. St. Francis Yacht Club
397. State Coastal Conservancy
398. State Lands Commission
399. Steckler-Pacific Co., Inc.-Kappas Marina
400. Strawberry Recreation District
401. Suisun City Marina
402. Suisun Resource Conservation District
403. SWRCB - Div. of Water Quality
404. The Bay Institute of San Francisco
405. The Dutra Group
406. The Presidio Group
407. Tiburon Center for Environmental Studies
408. ToxScan, Inc.
409. U.S. Army Corps of Engineers, SF District
410. U.S. Army Forces Command
411. U.S. Army, BRAC Environmental Office
412. U.S. Coast Guard, Port Operations
413. U.S. Department of Agriculture
414. U.S. Department of Commerce
415. U.S. Department of Energy, Assistant Secretary for Environmental Safety and Health
416. U.S. Department of Interior
417. U.S. Department of Interior, Office of Environmental Policy/Compliance
418. U.S. Department of Transportation
419. U.S. Department of Transportation, Coast Guard – San Francisco Bay
420. U.S. Environmental Protection Agency, Region IX
421. U.S. Fish and Wildlife Service
422. U.S. Fish and Wildlife Service, Endangered Species Division
423. U.S. Geological Survey
424. U.S. House of Representatives

Table 7-1. Distribution List for Notice of Availability for the HWRP ATF SEIS/EIR

Agency or Organization
425. U.S. House of Representatives, Committee on Transportation and Infrastructure
426. U.S. Navy
427. U.S. Navy, BRAC Office
428. U.S. Navy, Engineering Field Activity West
429. U.S. Navy, Naval Facilities Engineering Command
430. U.S. Senate
431. U.S. Senate, Committee on Environment and Public Works
432. University of Virginia, Law Library
433. URS Corporation
434. Valero Refining Company
435. Vallejo Ferry Service
436. Vallejo Yacht Club
437. Village Marin Hillside
438. Walton Environmental
439. Western Media
440. Western Oaks Village Association
441. Western States Petroleum Association
442. Weston Solutions, Inc.
443. Wetlands and Water Resources
444. Wickland Oil Co.
445. Wild Horse Valley Association
446. Winzler & Kelly Consulting Engineers
447. Woodlands Homeowners Association
448. Woodward-Clyde
449. Zentner and Zentner

Chapter 8
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Index

H

I

L

M

N

O

T

U

W