Suisun Marsh
Habitat Management, Preservation, and Restoration Plan

Final
Environmental Impact Statement/ Environmental Impact Report

Volume Ia: Main Report, Executive Summary and Chapters 1–5

U.S. Department of the Interior
Bureau of Reclamation

U.S. Fish and Wildlife Service

California Department of Fish and Game

November 2011

Mission Statements

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

The Mission of the Department of Fish and Game is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.

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Acronyms and Abbreviations

µS/cm	microSiemens per centimeter
2-D	two-dimensional
AB	Assembly Bill
AB32	Assembly Bill 32
ABAG	Association of Bay Area Governments
ACHP	Advisory Council on Historic Preservation
ADAM	Aerometric Data Analysis and Management System
af	acre-feet
AFB	Air Force Base
APE	area of potential effects
ARB	California Air Resources Board
BAAQMD	Bay Area Air Quality Management District
BAOS	Bay Area 2005 Ozone Strategy
BASH	bird airstrike hazard
Basin Plans	water quality control plans
Bay-Delta	San Francisco Bay/Sacramento–San Joaquin River Delta
BCDC	San Francisco Bay Conservation and Development Commission
BDCP	Bay-Delta Conservation Plan
BMPs	best management practices
BOD	biochemical oxygen demand
BOs	Biological Opinions
CAA	federal Clean Air Act
CAAA	Clean Air Act Amendments of 1990
CAAQS	state ambient air quality standards
CalEPA	California Environmental Protection Agency
CALFED	CALFED Bay-Delta Program
CalOSHA	California Division of Occupational Safety and Health
Caltrans	California Department of Transportation
CAP	Bay Area 2000 Clean Air Plan and Triennial Assessment
CAP	Solano County Climate Action Plan
CBDA	California Bay-Delta Authority
CCAA	California Clean Air Act of 1988
CCF	Clifton Court Forebay
CCMP	Comprehensive Conservation and Management Plan
CCMP	Comprehensive Conservation and Management Plan
CCR	California clapper rail

CDF	California State Department of Forestry and Fire Protection
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
CGS	California Geological Survey
CH_4	methane
CHP	California Highway Patrol
CHRIS	California Historical Resources Information System
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNG	compressed natural gas
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
Corps	U.S. Army Corps of Engineers
CPM	Certified Property Manager
CPUC	California Public Utilities Commission
CRHR	California Register of Historical Resources
CSLC	California State Lands Commission
CUPA	Certified Unified Program Agencies
CVP	Central Valley Project
CWA	federal Clean Water Act
CWC	California Water Code
CZMA	Coastal Zone Management Act
D-####	water right Decision ####
dB	Decibel
dBA	A-weighted decibel
Delta	Sacramento–San Joaquin River Delta
DFG	California Department of Fish and Game
DO	dissolved oxygen
DOI	Department of the Interior
DRERIP	Delta Regional Ecosystem Restoration Implementation Plan
DRMS	Delta Risk Management Strategy
DSL	Digital Subscriber Lines
DWR	California Department of Water Resources
E/I	export/inflow ratio
EC	electrical conductivity
EC	salinity
EFH	Essential Fish Habitat
EGP	Ecosystem Goals Project

EHW	extreme high water
EIS/EIR	Environmental Impact Statement/ Environmental Impact Report
EMS	emergency medical service
EPA	U.S. Environmental Protection Agency
ERP	Ecosystem Restoration Program
ERPP	Ecosystem Restoration Program Plan
ESA	federal Endangered Species Act
FAA	Federal Aviation Administration
FPD	Suisun Fire Protection District
fps	feet per second
FR	Federal Register
FSSD	Fairfield-Suisun Sewer District
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
General Construction Permit	NPDES General Permit for Stormwater Discharges Associated with Construction Activity
GHG	greenhouse gases
GIS	geographic information systems
GPS	global positioning system
GWh	gigawatt hours
GYS	Goodyear Slough
HDPE	high-density polyethylene
Hp	Horsepower
I-680	Interstate 680
I-80	Interstate 80
IPCC	Intergovernmental Panel on Climate Change
IRWMP	Integrated Regional Water Management Plan
ITAs	Indian Trust Assets
ITP	incidental take permits
ITS	incidental take statement
JUFI	Joint-Use Facility Improvements
km	Kilometers
L_{dn}	day-night level
L_{eq}	equivalent sound level
L_{max}	maximum sound level
L_{min}	minimum sound level
LNG	liquefied natural gas
LNG	liquefied natural gas
LOS	level of service

LTMS	Long-Term Management Strategy
LUFT	leaking fuel tank
L_{xx}	percentile-exceeded sound level
maf	million acre-feet
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MBTA	Migratory Bird Treaty Act
MCE	maximum credible earthquake
mcf	million cubic feet
MeHg	methyl-mercury
mg/L	milligrams per liter
MHHW	average of the highest tide mean higher high water
MHW	average high tide mean high water
MHW	mean high water
MIDS	Morrow Island Distribution System
MLHW	mean lower high water
MLLW	average lower low tide elevation
MLW	average of the low tide elevations
mm	millimeters
MOA	memorandum of agreement
MOU	memorandum of understanding
MOV	motorized valve
mph	miles per hour
MPWD	Maine Prairie Water District
MRZ	Mineral Resource Zone
mS/cm	milliSiemens per centimeter
MSCP	Multi-Species Conservation Plan
MSCS	Multi-Species Conservation Strategy
msl	feet above mean sea level
MTC	Metropolitan Transportation Commission
MTL	average (mean) tide elevation
MVEBs	motor vehicle emissions budgets
MW	Megawatts
N_2O	nitrous oxide
NAAQS	national ambient air quality standards
NAHC	Native American Heritage Commission
NEPA	National Environmental Policy Act
ng/l	nanograms per liter
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOA	Notice of Availability

NOAA	National Oceanic and Atmospheric Administration
NOC	Notice of Completion
NOD	Notice of Determination
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPMS	national pipeline mapping system
NRCS	U.S. Department of Agriculture's Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWIC	Northwest Information Center
O_3	ozone
OAP	2001 Revised San Francisco Bay Area Ozone Attainment Plan for the 1-Hour National Ozone Standard
OES	Office of Emergency Services
OPR	Office of Planning and Research
OPS	Office of Pipeline Safety
OSHA	Occupational Safety and Health Administration
PAI	Preservation Agreement Implementation
PEIS/EIR	CALFED Programmatic Environmental Impact Statement/Environmental Impact Report
PG&E	The Pacific Gas and Electric Company
PM2.5 and PM10	particulate matter 2.5 microns or less and 10 microns or less in diameter
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
PPV	peak particle velocity
PRBO	Point Reyes Bird Observatory
PRC	California Public Resources Code
psu	parts sea salt
RACMs	reasonably available control measures
RD	Reclamation District
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RGP	Regional General Permit
RMP	risk management plan
ROD	Record of Decision
ROG	reactive organic gases
RRDS	Roaring River Distribution System
RWQCB	Regional Water Quality Control Board
SCGP	Solano County General Plan
SCMAD	Solano County Mosquito Abatement District
SCWA	Solano County Water Agency

SEMSC	Solano Emergency Medical Services Cooperative
SEW	Suisun Ecological Workgroup
SFEI	San Francisco Estuary Institute
SFEP	San Francisco Estuary Project
SHPO	State Historic Preservation Officer
SID	Irrigation District
SIP	state implementation plan
SLRSP	Sea Level Rise Strategic Program
SMARA	Surface Mining and Reclamation Act of 1975
SMHM	salt marsh harvest mouse
SMLIT	Suisun Marsh Levee Investigation Team
SMP	Suisun Marsh Plan
SMPA	Suisun Marsh Preservation Agreement
SMPP	Suisun Marsh Protection Plan
SMSCG	Suisun Marsh Salinity Control Gates
SO_2	sulfur dioxide
SOCCR	State of the Carbon Cycle Report
SRCD	Suisun Resource Conservation District
SS	suspended sediment
State Water Board	State Water Resources Control Board
SWP	State Water Project
SWPPP	stormwater pollution prevention plan
TACs	toxic air contaminants
TDS	total dissolved solids
Tg	million tons
TMDL	total maximum daily load
TNM	Traffic Noise Model
TOC	total organic carbon
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOCs	volatile organic compounds
VOCs	volatile organic carbons
VSFCD	Vallejo Sanitation and Flood Control District
Williamson Act	California Land Conservation Act of 1965
WQCP	Water Board Bay-Delta Water Control Plan
WQCP	Water Quality Control Plan
WQCPs or Basin Plans	Water Quality Control Plans
X2	salinity gradient
YSAQMD	Yolo-Solano County Air Quality Management District

Executive Summary

Introduction

The Suisun Marsh Habitat Management, Preservation, and Restoration Plan, referred to from here on as the Suisun Marsh Plan (SMP), is being pursued by the Suisun Principal Agencies (or Principals), a group of agencies with primary responsibility for Suisun Marsh management, and is intended to balance the benefits of tidal wetland restoration with other habitat uses in the Marsh by evaluating alternatives that provide a politically acceptable change in Marsh-wide land uses, such as salt marsh harvest mouse habitat, managed wetlands, public use, and upland habitat. It relies on the incorporation of existing science and information developed through adaptive management. The Principals are U.S. Fish and Wildlife Service (USFWS), U.S. Department of the Interior, Bureau of Reclamation (Reclamation), California Department of Fish and Game (DFG), California Department of Water Resources (DWR), National Marine Fisheries Service (NMFS), Suisun Resource Conservation District (SRCD), and CALFED Bay-Delta Program (CALFED). The Principals have consulted with other participating agencies, such as the U.S. Army Corps of Engineers (Corps), San Francisco Bay Conservation and Development Commission (BCDC) the Regional Water Quality Control Board (RWQCB) and the State Water Resources Control Board (State Water Board), in developing this plan.

Each Principal Agency will use this Environmental Impact Statement/ Environmental Impact Report (EIS/EIR) to adopt particular actions described in the document and will contribute to the overall implementation of the SMP. For purposes of this document, Reclamation and USFWS are the joint National Environmental Policy Act (NEPA) lead agencies, and DFG is the California Environmental Quality Act (CEQA) lead agency. This Executive Summary summarizes the Proposed Project/Preferred Alternative and alternatives, the SMP implementation strategy, environmental commitments, and impacts and mitigation measures. It is based largely on the information provided in Chapters 1 and 2 of the SMP EIS/EIR.

Suisun Marsh Regulatory and Management Background

Suisun Marsh is the largest contiguous brackish water marsh remaining on the west coast of North America and is a critical part of the San Francisco

Bay/Sacramento–San Joaquin River Delta (Bay-Delta) estuary ecosystem. It is home to public waterfowl hunting areas and 158 private duck clubs. The Marsh encompasses more than 10% of California's remaining natural wetlands and serves as the resting and feeding ground for thousands of birds migrating on the Pacific Flyway and resident waterfowl. In addition, the Marsh provides important habitat for more than 221 bird species, 45 mammalian species, 16 different reptile and amphibian species, and more than 40 fish species. Suisun Marsh supports the state's commercial salmon fishery by providing important tidal rearing areas for juvenile fish. Approximately 200 miles of levees in the Marsh contribute to managing salinity in the Sacramento–San Joaquin River Delta (Delta). The Marsh's large open space and proximity to urban areas make it ideally suited for wildlife viewing, hiking, canoeing, and other recreation opportunities. Figure ES-1 shows the location of Suisun Marsh.

The values of the Marsh have been recognized, and several agencies have been involved in its protection since the mid-1970s. In 1974 the Nejedly-Bagley-Z'Berg Suisun Marsh Preservation Act was enacted by the California Legislature to protect the Marsh from urban development. In 1976, the BCDC developed the Suisun Marsh Protection Plan (SMPP), which defined and limited development within the primary and secondary management area for the "future of the wildlife values or the area as threatened by potential residential, commercial, and industrial development." The SMPP states that its focus is on maintaining waterfowl habitat, but it also addresses the importance of tidal wetlands. The SMPP calls for the preservation of Suisun Marsh; preservation of waterfowl habitat; improvement to water distribution and levee systems; and encouraging agriculture that is consistent with wildlife and waterfowl, such as grazing. In 1977, the California Legislature implemented the Suisun Marsh Preservation Act of 1977, which calls for the implementation of the SMPP and designates BCDC as the state agency with jurisdiction over the Marsh; it calls for the SRCD to have the primary local responsibility for water management on privately owned lands in the Marsh.

In 1987, Reclamation, DWR, DFG, and SRCD signed the Suisun Marsh Preservation Agreement (SMPA), which contains provisions for Reclamation and DWR to mitigate the adverse effects on Suisun Marsh channel water salinity from the State Water Project (SWP) and Central Valley Project (CVP) operations and other upstream diversions. It required Reclamation and DWR to meet salinity standards as specified in the then-current State Water Board D-1485, set a timeline for implementing the Plan of Protection for the Suisun Marsh, and delineated monitoring and mitigation requirements.

In 2000, the CALFED Record of Decision (ROD) was signed, which included the Ecosystem Restoration Program (ERP) calling for the restoration of 5,000 to 7,000 acres of tidal wetlands and the enhancement of 40,000 to 50,000 acres of managed wetlands (CALFED Bay-Delta Program 2000a). In 2001, the Principal Agencies directed the formation of a charter group to develop a plan for Suisun Marsh that would balance the needs of CALFED, the SMPA, and other plans by protecting and enhancing existing land uses, existing waterfowl and wildlife values including those associated with the Pacific Flyway, endangered species,

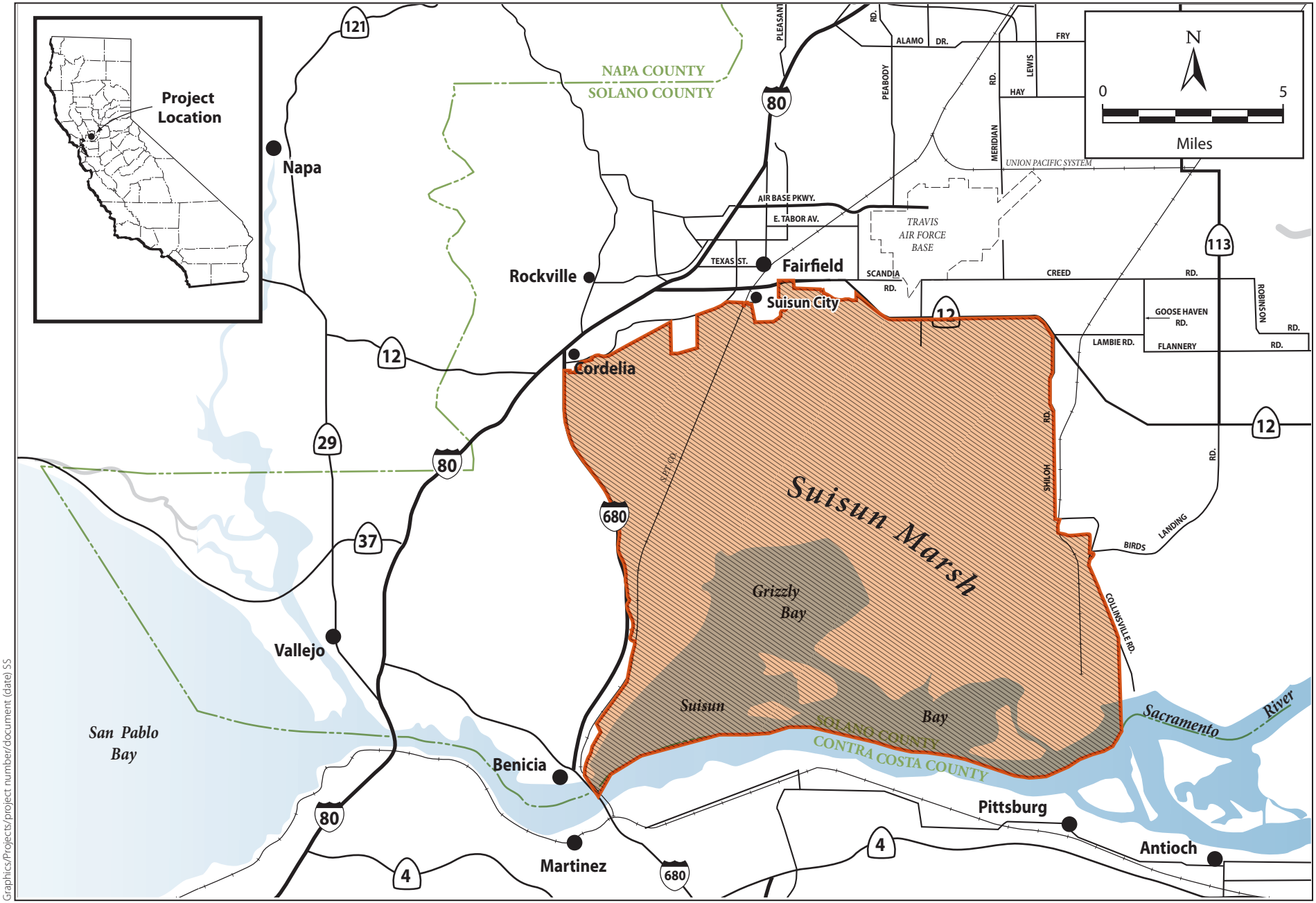

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Figure ES-1
Project Location

and state and federal water project supply quality. In addition to the Principal Agencies, the charter group includes other regulatory agencies such as the Corps, BCDC, and the State and Regional Water Boards.

This EIS/EIR describes three alternative 30-year plans and their potential impacts. The adopted alternative will become the SMP. Each Principal Agency's action related to the SMP is shown in Table ES-1. It is important to note that Principal Agencies and other agencies may choose to implement additional restoration and other activities beyond what is described in this SMP.

Table ES-1. Principal Agencies' Actions Related to the Suisun Marsh Plan

Agency	Suisun Marsh Habitat Management, Preservation, and Restoration Plan Action
Reclamation	Implementation of Managed Wetland Activities Implementation of PAI Fund[1]
USFWS	Implementation of Restoration Issuance of Biological Opinion
DFG	Implementation of Restoration Implementation of Managed Wetland Activities Issuance of Incidental Take Permit for non–Fully Protected Species Implementation of PAI Fund
NMFS	Issuance of Biological Opinion; Issuance of Essential Fish Habitat Conservation Recommendations
DWR	Implementation of Restoration Implementation of Managed Wetland Activities Implementation of PAI Fund
SRCD	Implementation of Managed Wetland Activities Implementation of PAI Fund
CALFED	Provide Guidance for Restoration through the Science Program

Reclamation = U.S. Department of the Interior, Bureau of Reclamation.
PAI = Preservation Agreement Implementation.
USFWS = U.S. Fish and Wildlife Service.
DFG = California Department of Fish and Game.
NMFS = National Marine Fisheries Service.
DWR = California Department of Water Resources.
SRCD = Suisun Resource Conservation District.
CALFED = CALFED Bay-Delta Program.

[1] The PAI Fund is included in the Revised SMPA and is proposed to fund certain maintenance activities to support mitigation obligations for the CVP and SWP operations, and is described in Chapter 2.

The Need, Purpose, and Objectives of the Suisun Marsh Plan

Need for the Suisun Marsh Plan

The SMP is a comprehensive plan designed to address the various conflicts regarding use of Marsh resources, with the focus on achieving an acceptable multi-stakeholder approach to the restoration of tidal wetlands and the management of managed wetlands and their functions. As such, the SMP is intended to be a flexible, science-based, management plan for Suisun Marsh, consistent with the revised SMPA and CALFED. It also is intended to set the regulatory foundation for future actions. The need for the action is based on the following major Marsh resources and functions.

Habitats and Ecological Processes

The conversion of tidal wetlands as a result of diking resulted in a loss of habitat for many species, including those now listed as threatened or endangered. Development in areas surrounding the Marsh has resulted in introduction and spread of nonnative species, fish entrainment issues, and degradation of water quality. Additionally, there have been water quality effects from drainage operations in managed wetlands. While taking appropriate steps to restore the ecological values of historical tidal wetland habitat, efforts will be made to improve management of managed wetlands and to lessen adverse effects from development, nonnative species, and detrimental land use practices in the secondary management areas and adjacent metropolitan areas.

Public and Private Land Use

Managed wetlands, tidal wetlands, and uplands, whether publicly or privately owned, provide important wetlands for migratory waterfowl and other resident and migratory wetland-dependent species and opportunities for hunting, fishing, bird watching, and other recreational activities. There is a need to maintain these opportunities as well as improve public stewardship of the Marsh to ensure that the implementation of restoration and managed wetland activities is understood and valued for both public and private land uses.

Levee System Integrity

Of the more than 200 miles of exterior levees in Suisun Marsh, only about 20 miles along Suisun, Grizzly, and Honker Bays (authorized through AB 360) receive public funding. Additionally, as restoration actions are implemented, some interior levees will be converted to exterior levees and will require

reinforcement and more maintenance, and in some instances significant upgrades. Because of current restrictions preventing dredging from sloughs and constraints on importing materials, landowners in the Marsh have maintained their exterior levees using primarily material from ditch cleaning or pond bottom grading for more than a decade, a practice that increases subsidence and potentially weakens the existing levee foundations. These factors combined have exhausted the supply of levee maintenance material in the managed wetlands and have forced maintenance to be deferred on some exterior levees, increasing the risk of catastrophic flooding.

Water Quality

Multiple factors contribute to the water quality in Suisun Marsh, including upstream diversion, reduced Delta outflow, state and federal water project operations and diversions, drainage practices in managed wetlands, minimal tidal exchange in dead-end sloughs, urban runoff, erosion, agricultural runoff, discharge from the Fairfield Suisun Sewer District treatment plant to Boynton Slough, and remnant contaminants such as mercury. Improvement of water quality and management practices will benefit the ecological processes for all habitats, including managed and tidal wetlands.

Plan Objectives/Purpose

The SMP is intended to address the full range of issues in the Marsh, as described in the Need for Action section above. As such, the SMP purposes/objectives are divided by topic but are linked geographically, ecologically, and socially. The plan purposes/objectives are:

- **Habitats and Ecological Processes—**implement the CALFED Ecosystem Restoration Program Plan (ERPP) restoration target for the Suisun Marsh ecoregion of 5,000 to 7,000 acres of tidal marsh and protection and enhancement of 40,000 to 50,000 acres of managed wetlands;
- **Public and Private Land Use—**maintain the heritage of waterfowl hunting and other recreational opportunities and increase the surrounding communities' awareness of the ecological values of Suisun Marsh;
- **Levee System Integrity—**maintain and improve the Suisun Marsh levee system integrity to protect property, infrastructure, and wildlife habitats from catastrophic flooding; and
- **Water Quality—**protect and, where possible, improve water quality for beneficial uses in Suisun Marsh, including estuarine, spawning, and migrating habitat uses for fish species as well as recreational uses and associated wildlife habitat.

The SMP requires that these interrelated and interdependent purposes/objectives be implemented to some extent through all SMP actions. For example, the levee

system integrity purpose/objective would ensure that managed wetlands are protected from catastrophic flooding, thus contributing to meeting the portion of the habitats and ecological processes purpose/objective that addresses protection of managed wetlands. Similarly, the restoration of certain properties may help protect and/or improve water quality, and achieving the habitats and ecological processes purpose/objective also would help to achieve the private and public land use purpose/objective. Recognizing these relationships, the SMP is proposed to contribute to meeting each of them in parallel over the 30-year planning period.

Overview of Plan Elements

The SMP is a comprehensive plan designed to address the various conflicts regarding use of Marsh resources, with the focus on achieving an acceptable multi-stakeholder approach to the restoration of tidal wetlands and the management of managed wetlands and their functions. The SMP addresses habitats and ecological process, public and private land use, levee system integrity, and water quality through restoration and managed wetland activities. The plan is intended to guide near-term and future actions related to restoration of tidal wetlands and managed wetland activities. Specific actions that would be implemented in the near term under the SMP include revising the SMPA to implement the PAI Fund and implementation of increased frequency of current and new managed wetland activities.

Alternatives

Three alternatives were evaluated in the EIS/EIR, varying in the number of acres restored and the number of acres subject to managed wetland activities. Table ES-2 summarizes these differences.

Table ES-2. Differences in Amount of Tidal Wetlands Restored and Remaining Acres Subject to Managed Wetland Activities among the Alternatives (in acres)

Alternative	Tidal Restoration Target (acres)	Managed Wetlands Subject to Managed Wetland Activities (acres)
No Action Alternative	700	52,112
Alternative A, Proposed Project	5,000–7,000	44,000–46,000
Alternative B	2,000–4,000	46,000–48,000
Alternative C	7,000–9,000	42,000–44,000

The lead agencies have identified Alternative A as the Preferred Alternative because of its consistency with the restoration and enhancement goals of the ERPP, its ability to contribute to recovery of listed species, and acceptability by landowners in the Marsh.

The total amount of existing managed wetlands and uplands that could be affected by tidal restoration and managed wetland activities is 52,112 acres. The Marsh has been divided into four regions for purposes of this analysis (Figure ES-2). The tidal wetland restoration acreages for each alternative are described by region to achieve the total CALFED goal as described above and contribute to the USFWS tidal wetlands restoration goals. The USFWS *Draft Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California* (http://www.fws.gov/sacramento/ea/news_releases/2010_News_Releases/tidal_marsh_recovery.htm) was used as a template in determining the goal of the percentage of restoration acreage per region (U.S. Fish and Wildlife Service 2010). Table ES-3 shows the total acreage that is potentially restorable in each region under the SMP, and how much of each region would be restored under each alternative. The SMP includes the continued implementation of and increased frequency of some managed wetland activities and the implementation of new managed wetland activities on the balance of 52,112 acres that is not restored.

Table ES-3. Total Restorable Acres per Region and Percentage That Will Be Restored under Each Alternative

Alternative/Region	SMP Target for Tidal Wetland Restoration*	Percentage of Existing Managed Wetlands That Will Be Restored to Tidal Wetland under the SMP
Alternative A, Proposed Project	**5,000–7,000**	
Region 1	1,000–1,500	8.4%–12.6%
Region 2	920–1,380	12.6%–18.9%
Region 3	360–540	12.1%–18.1%
Region 4	1,720–2,580	6.0%–9.0%
Alternative B	**2,000–4,000**	
Region 1	500–1,000	4.2%–8.4%
Region 2	460–920	6.3%–12.6%
Region 3	180–360	6.0%–12.1%
Region 4	860–1,720	3.0%–6.0%
Alternative C	**7,000–9,000**	
Region 1	1,500–2,250	12.6%–18.9%
Region 2	1,380–2,070	18.9%–28.5%
Region 3	540–810	18.1%–27.3%
Region 4	2,580–3,870	9.0%–13.5%

USFWS = U.S. Fish and Wildlife Service.

SMP = Suisun Marsh Habitat Management, Preservation, and Restoration Plan.

* The targets were developed for each region based on the different habitat conditions within each region to provide the range of environmental gradients necessary to contribute to the recovery of listed species. These targets complement and are consistent with the Draft Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California. The Adaptive Management Plan will track these targets to ensure restoration benefits for listed species.

Note: Adjustments to the Adaptive Management Plan may result in changes to the targets in each region.

Of the restored areas, a certain portion is expected to become tidal aquatic habitat. The percent cover of tidal aquatic habitat within tidal wetlands areas (Rush Ranch, Lower Joice Island, and Hill Slough) in Suisun Marsh was estimated based on existing tidal wetlands, the Integrated Regional Wetland Monitoring Pilot Project (BREACH), and GIS and site visits. The analysis demonstrated that tidal aquatic habitat accounts for an average of approximately 5 to 15% of the total area of established tidal wetlands. Assuming this relationship holds true for future restored tidal wetlands, Table ES-4 shows the increase of tidal aquatic habitat that would be expected to result when each action alternative is fully implemented and sites develop into fully functioning tidal marshes. The increase in acreage of tidal aquatic habitat shown does not limit the amount of restoration that could occur.

Table ES-4. Increase of Tidal Aquatic Habitat in Suisun Marsh Resulting from Each Alternative

Alternative	Tidal Wetlands Restored	Tidal Aquatic Habitat Increase
Alternative A, Proposed Project	5,000–7,000	250–1050 acres
Alternative B	2,000–4,000	100–600 acres
Alternative C	7,000–9,000	350–1,350 acres

Over the 30-year SMP implementation period, it is expected that the exact habitat amount provided by restored areas will depend on the existing elevation of the site, sedimentation rates and accretion, and sea level rise. The amount of subtidal aquatic habitat is expected to decrease gradually as sediment accretes and emergent tidal vegetation is established at each restoration site. As this happens, the site will be restored to a tidal wetland. However, the rate of accretion and the rate of sea level rise will dictate the end result, and the actual timeframe for such progression depends on the site-specific conditions, but significant geomorphic changes are decadal. Locations with large subsidence and low sediment concentrations may never return to emergent marsh and instead remain as open water. Adaptive management also will be used to improve restoration designs to achieve desired results.

Suisun Marsh Plan Implementation Strategy

The SMP is predicated on the assumption that each Principal Agency will implement or approve activities in the Marsh consistent with the SMP and its own mission and jurisdictional authority. The primary components of the strategy are to:

- implement the environmental commitments and mitigation measures in this EIS/EIR and other required state and federal permit measures to ensure that resources are protected and that restoration and managed wetland goals are met simultaneously,

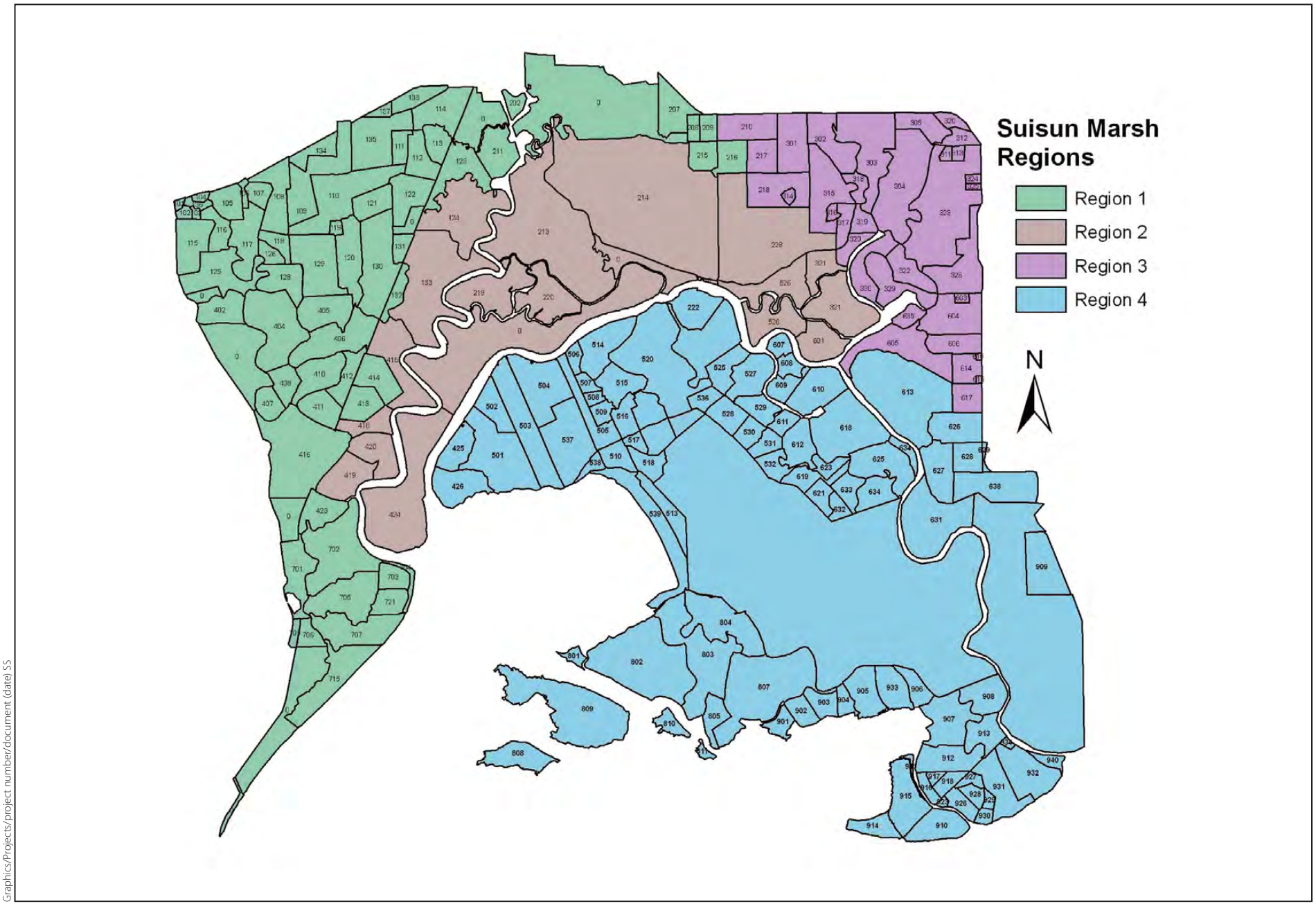

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Figure ES-2
Suisun Marsh Regions

- implement adaptive management to ensure impacts described in this EIS/EIR are not exceeded and to improve the ecological effectiveness of restoration over the period of implementation of the SMP, and
- prepare annual reports on the status of SMP restoration and managed wetland activities.

To ensure that the restoration and managed wetland goals both are achieved within the 30-year time frame, the Charter Agencies have developed a strategy to implement the SMP. The SMP would contribute to recovery of many species in the Marsh, and for this EIS/EIR, implementation of the entirety of the Proposed Project, including both the restoration activities and managed wetland activities, is an integral part of the analysis. Based on the analysis in this EIS/EIR, implementation of the Proposed Project and environmental commitments would provide sufficient tidal restoration and resource protection of fish and wildlife resources to both offset potential impacts on those resources and contribute to recovery of listed species. As such, both restoration and managed wetland activities would proceed simultaneously, and implementation will be planned to carefully monitor and mitigate the effects of SMP activities. SRCD, DFG, Reclamation, and DWR would implement the Managed Wetland Activities. Any of the Principals could implement restoration.

The managed wetland activities would be implemented only if at least one third of the total restoration activities would be implemented in each of the 10-year increments. Therefore, it is expected that under the Proposed Project, for example, 1,600–2,300 acres in the Marsh would be restored by year 10, an additional 1,600–2,300 acres would be restored by year 20, and the full 5,000–7,000 acres would be restored by year 30. This would ensure that all actions would be implemented in a timeframe similar to that of the impacts and that restoration efforts would contribute toward recovery throughout the plan implementation period. If these 10-year incremental SMP restoration goals are met, both the managed wetland activities and tidal restoration would continue to ensure that the SMP goals would be met. Options for addressing conditions in which these incremental goals are not met are described below. Under this strategy, the restoration and managed wetland goals would be achieved concurrently. How the restoration acres would be applied for purposes of other regulatory permitting requirements (i.e., recovery vs. mitigation) would be specified through each permit as applicable.

To track the progress of restoration and managed wetland activities, the SMPA agencies (Reclamation, SRCD, DWR, and DFG) would submit implementation status reports annually to DFG, NMFS, and USFWS and other regulatory agencies that would describe the implemented restoration and managed wetland activities. Additional activities, including monitoring, application of adaptive management, results of adaptive management, and any activities that are being planned, would be submitted no less frequently than every other year.

Anticipated Near-Term Restoration Actions

The Hill Slough parcel in the Marsh is currently owned by the Principals and would likely be restored upon implementation of the SMP. The parcel comprises approximately 950 acres and would contribute to the total restoration acres for whichever alternative is selected. Although many of the potential impacts of restoration of this site are included in this EIS/EIR, a separate notice of determination and/or record of decision will be made if and when a decision to restore this area is made.

Impacts and Mitigation Measures

For the most part, the SMP components would be implemented in a way that helps mitigate impacts before or as they occur. However, four significant and unavoidable impacts were identified related to disturbance to cultural resources. Table ES-5, at the end of this summary, summarizes the impacts identified in the EIS/EIR.

Environmental Commitments

As part of the plan implementation, individual project proponents will incorporate certain environmental commitments and BMPs into specific projects to avoid or minimize potential impacts as applicable. Project proponents and the appropriate agencies also will coordinate planning, engineering, and design phases of the project. The environmental commitments are divided between Restoration Activities and Managed Wetland Activities. For restoration activities, project proponents are defined as any state, federal or local agency, landowner, or implementing body of a restoration action. For managed wetland activities, the SMPA Agencies (SRCD, DFG, DWR, and/or Reclamation) are the project proponents and will be responsible for implementing the environmental commitments, depending on the activity.

Restoration Activities

- implementation of BMPs, avoidance and minimization measures, and BO terms and conditions;
- implementation of stormwater pollution prevention plan and erosion and sediment control plan;
- compliance with Solano County's noise ordinance;
- implementation of traffic and navigation control plan and emergency access plan;
- implementation of Mosquito Abatement BMPs;

- implementation of hazardous materials management plan;
- implementation of air quality BMPs;
- cultural resources Native American graves protection;
- environmental awareness worker training;
- construction period restrictions;
- special-status wildlife protection through surveys, buffers, and monitoring;
- implementation of construction period restrictions; and
- nonnative plant control.

Managed Wetland Activities

- continuation of existing BMPs and BO terms and conditions,
- construction period restrictions,
- dredging practices to minimize impacts on the aquatic environment,
- implementation of hazardous materials management plan,
- cultural resources Native American graves protection, and
- environmental awareness worker training.

Public Involvement and Next Steps

Development of the SMP has been a multi-agency, collaborative process in an effort to design a plan to balance the various resources in the Marsh. Throughout the process, Principal Agencies (DFG, Reclamation, USFWS, NMFS, SRCD, DWR, and CALFED) have cooperated to develop the various components of the plan. Additionally, landowners in the Marsh and other agencies that have a jurisdictional or other stake in the outcome of the SMP have been engaged. These agencies include the Corps, BCDC, State Water Board, RWQCB, and Solano County.

Reclamation and FWS jointly filed an NOI on November 10, 2003, and DFG filed an NOP on November 7, 2003. Both the NOI and the NOP invited the public and agencies to provide comments during the scoping period. Three scoping meetings were held, one each on November 25, 2003 in Fairfield, CA; December 4, 2003 in Benicia, California; and December 10, 2003 in Fairfield, California. The November 25 meeting was during business hours, while the other two began at 6 p.m. In total, over 150 people attended these meetings. The scoping report provides additional information about the scoping procedures and outcomes. All of these issues and concerns were considered in the development of the plan, alternatives, and/or analysis of resource impacts.

This Public Draft EIS/EIR was available for review and comment for 60 days (October 29, 2010 through December 28, 2010) following filing of the Notice of Availability (NOA) of the EIS with the EPA and the Notice of Completion (NOC) of the EIR with the California State Clearinghouse.

This Final EIS/EIR includes responses to public and agency comments (Chapter 14) and changes in the text. All of the comments received are also included in Chapter 14 of this Final EIS/EIR. A total of 17 comment letters were received. Alternative A was identified as the Preferred Alternative and DFG, USFWS, and Reclamation will issue a Notice of Determination (NOD)/Record of Decision (ROD), respectively, for the decision regarding which alternative will become the SMP to be implemented.

Expected Outcomes

Besides the NEPA and CEQA compliance efforts for the SMP, the Principals expect to obtain other environmental permits as outlined in Table ES-1. Together with the completion of the CEQA and NEPA process, these permits will allow Principal and other agencies to implement restoration in the Marsh and allow the SMPA agencies to implement managed wetland activities.

Table ES-5. Summary of Impacts and Mitigation Measures

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
WATER SUPPLY AND MANAGEMENT				
Restoration Impacts				
WTR-1: Reduction in Water Availability for Riparian Water Diversions to Managed Wetlands Upstream or Downstream of Restoration Areas	A, B, C	Less than significant	None required	–
WTR-2: Increased Tidal Velocities from Breaching of Managed Wetlands Levees	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
WTR-3: Improved Water Supply as a Result of Improved Flooding and Draining of Managed Wetlands	A, B, C	Beneficial	–	–
WTR-4: Increased Tidal Flows and Improved Water Supply as a Result of Dredging	A, B, C	Beneficial	–	–
WATER QUALITY				
Restoration Impacts				
WQ-1: Increased Salinity in Suisun Marsh Channels from Increased Tidal Flows from Suisun Bay (Grizzly Bay) as a Result of Restoration	A, B, C	Less than significant	None required	–
WQ-2: Changes to Salinity of Water Available for Managed Wetlands from October to May	A, B, C	Less than significant	None required	–
WQ-3: Increased Salinity at Delta Diversions and Exports	A, B, C	Less than significant	None required	–
WQ-4: Possible Changes to Methylmercury Production and Export as a Result of Tidal Restoration	A, B, C	Less than significant	None required	–
WQ-5: Improved Dissolved Oxygen Concentrations in Tidal Channels from Reduced Drainage of High Sulfide Water from Managed Wetlands	A, B, C	Beneficial	None required	–
WQ-6: Temporary Changes in Water Quality during Construction Activities	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
Managed Wetland Activities Impacts				
WQ-7: Temporary Degradation of Water Quality during Implementation of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WQ-8: Temporary Degradation of Water Quality during Dredging, Including Possible Increases in Mercury Concentrations	A, B, C	Less than significant	None required	–
GEOLOGY AND GROUNDWATER				
Restoration Impacts				
GEO-1: Potential to Create Unstable Cut or Fill Slopes	A, B, C	Less than significant	None required	–
GEO-2: Potential for Accelerated Soil Erosion	A, B, C	Beneficial or Less than significant	None required	–
GEO-3: Potential Loss of Topsoil Resources	A, B, C	Less than significant	None required	–
GEO-4: Reduction in Availability of Non-Fuel Mineral Resources	A, B, C	Less than significant	None required	–
GEO-5: Reduction in Availability of Natural Gas Resources	A, B, C	Less than significant	None required	–
GW-6: Potential for Altered Salinity in Shallow Suisun Marsh Groundwater	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
GEO-1: Potential to Create Unstable Cut or Fill Slopes	A, B, C	Less than significant	None required	–
GEO-2: Potential for Accelerated Soil Erosion	A, B, C	Beneficial or Less than significant	None required	–
GEO-5: Reduction in Availability of Natural Gas Resources	A, B, C	No impact	–	–
GEO-7: Potential for Damage to Structures as a Result of Surface Fault Rupture, Groundshaking and/or Seismically Induced Ground Failure (Liquefaction)	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
GEO-8: Potential for Damage to Structures as a Result of Landslides, Including Seismically Induced Landslides	A, B, C	Less than significant	None required	–
FLOOD CONTROL AND LEVEE STABILITY				
Restoration Impacts				
FC-1: Increased Potential for Catastrophic Levee Failure and Flooding Resulting from Restoration Activities That Expose Interior Levees to Tidal Action	A, B, C	Less than significant	None required	–
FC-2: Changes in Flood Stage and Flow Capacity in Suisun Marsh Channels as a Result of Increased Tidal Prism and Flood Storage Capacity	A, B, C	Beneficial	–	–
FC-3: Temporary Decrease in Levee Stability Resulting from Construction Activities	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
FC-4: Reduction in Potential for Catastrophic Levee Failure and Flooding Resulting from Improvements in Exterior Levee Maintenance	A, B, C	Beneficial	–	–
SEDIMENT TRANSPORT				
Restoration Impacts				
ST-1: Increased Scour in Bays or Channels Upstream and Downstream of Habitat Restoration Areas	A, B, C	Less than significant	None required	–
ST-2: Deposition of Sediment in the Restored Tidal Wetlands	A, B, C	Beneficial or Less than significant	None required	–
ST-3: Changes in Regional Sedimentation and Scour Patterns in Suisun Marsh	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
ST-4: Increase in Erosion Adjacent to Dredging Sites	A, B, C	Less than significant	None required	–
ST-5: Increase in Deposition at Dredging Sites	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
TRANSPORTATION AND NAVIGATION				
Restoration Impacts				
TN-1: Temporary Addition of Vehicles to Roadway System and Alteration of Patterns of Vehicular Circulation during Construction Activities	A, B, C	Less than significant	None required	–
TN-2: Temporary Increases in Road Hazards during Construction Activities	A, B, C	Less than significant	None required	–
TN-3: Damage to Roadway Surfaces from Construction Activities	A, B, C	Less than significant	None required	–
TN-4: Impacts to Air Traffic Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
TN-5: Impacts on Land Use Attributable to Restoration Activities within Travis Air Force Base Zone	A, B, C	Less than significant	None required	–
TN-6: Temporary Reduction in Boat Access during Construction Activities	A, B, C	Less than significant	None required	–
TN-7: Decrease in Rail Line Integrity and Disruption to Rail Service	A, B, C	Less than significant	None required	–
TN-8: Short-Term Reduction in Navigable Areas Resulting from Increased Velocities after Restoration Activities	A, B, C	Less than significant	None required	–
TN-9: Temporary Reduction in Boat Access during Dredging Activities	A, B, C	Less than significant	None required	–
TN-10: Increases in Navigable Areas of Suisun Marsh	A, B, C	Beneficial	–	–
TN-11: Operations and Maintenance Increase in Traffic	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
TN-1: Temporary Addition of Vehicles to Roadway System and Alteration of Patterns of Vehicular Circulation during Construction Activities	A, B, C	Less than significant	None required	–
TN-2: Temporary Increases in Road Hazards during Construction Activities	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
TN-3: Damage to Roadway Surfaces from Construction Activities	A, B, C	Less than significant	None required	–
TN-4: Impacts to Air Traffic Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
TN-5: Impacts on Land Use Attributable to Restoration Activities within Travis Air Force Base Zone	A, B, C	Less than significant	None required	–
TN-6: Temporary Reduction in Boat Access during Construction Activities	A, B, C	Less than significant	None required	–
TN-7: Decrease in Rail Line Integrity and Disruption to Rail Service	A, B, C	Less than significant	None required	–
TN-9: Temporary Reduction in Boat Access during Dredging Activities	A, B, C	Less than significant	None required	–
TN-11: Operations and Maintenance Increase in Traffic	A, B, C	Less than significant	None required	–
AIR QUALITY				
AQ-1: Generation of Construction-Related Emissions in Excess of Draft BAAQMD Standards Associated with Restoration	A, B, C	Significant	AQ-MM-1: Limit Construction Activity during Restoration AQ-MM-2: Reduce Construction NO_X Emissions AQ-MM-3: Implement All Appropriate BAAQMD Mitigation Measures	Less than significant
AQ-2: Generation of Construction-Related Emissions in Excess of Draft BAAQMD Standards Associated with Current Management Activities	A, B, C	Significant	AQ-MM-2: Reduce Construction NO_X Emissions AQ-MM-3: Implement All Appropriate BAAQMD Mitigation Measures	Less than significant
AQ-3: Generation of Construction-Related Emissions in Excess of Draft BAAQMD Standards Associated with New Management Activities	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
AQ-4: Generation of Construction-Related Emissions in Excess of Draft BAAQMD Standards Associated with Restoration and Management Activities Combined	A, B, C	Significant	AQ-MM-1: Limit Construction Activity during Restoration AQ-MM-2: Reduce Construction NO_X Emissions AQ-MM-3: Implement All Appropriate BAAQMD Mitigation Measures AQ-MM-4: Limit Construction Activity during Restoration and Management	Less than significant
AQ-5: Construction-Related Diesel Health Risk Associated with Restoration	A, B, C	Less than significant	None required	–
AQ-6: Construction-Related Diesel Health Risk Associated with Current Management Activities	A, B, C	Less than significant	None required	–
AQ-7: Construction-Related Diesel Health Risk Associated with New Management Activities	A, B, C	Less than significant	None required	–
AQ-8: Construction-Related Diesel Health Risk Associated with Restoration and Management Activity Combined	A, B, C	Less than significant	None required	–
AQ-9: Increase in Construction Emissions in Excess of Federal *de Minimis* Thresholds	A, B, C	Less than significant	None required	–
AQ-10: Increase in Construction-Related Odor	A, B, C	Less than significant	None required	–
NOISE				
Restoration Impacts				
NZ-1: Temporary Increases in Ambient Noise during Construction Activities Associated with Restoration	A, B, C	Less than significant	None required	–
NZ-2: Temporary Exposure of Sensitive Land Uses to Groundborne Vibration or Noise from Construction Activities	A, B, C	Less than significant	None required	–
NZ-3: Permanent Increases in Ambient Noise	A, B, C	Less than significant	None required	–
NZ-4: Exposure of Noise-Sensitive Land Uses to Noise from Material Hauling Operations	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
Managed Wetland Activities Impacts				
NZ-2: Temporary Exposure of Sensitive Land Uses to Groundborne Vibration or Noise from Construction Activities	A, B, C	Less than significant	None required	–
NZ-3: Permanent Increases in Ambient Noise	A, B, C	Less than significant	None required	–
NZ-4: Exposure of Noise-Sensitive Land Uses to Noise from Material Hauling Operations	A, B, C	Less than significant	None required	–
NZ-5: Temporary Increases in Ambient Noise during Construction Activities Associated with Management Activities	A, B, C	Less than significant	None required	–
NZ-6: Exposure of Noise-Sensitive Land Uses to Noise from Portable Pump Operations	A, B, C	Significant	NZ-MM-1: Limit Noise from Pump Operations	Less than significant
CLIMATE CHANGE				
CC-1: Construction-Related Changes in Greenhouse Gas Emissions	A, B, C	Less than significant	None required	–
CC-2: Permanent Changes in Greenhouse Gas Sources and Sinks	A, B, C	Beneficial	None required	–
CC-3: Degradation of Wetland Habitat and Ecosystem Health as a Result of Inundation Associated With Sea Level Rise	No Action Alternative	–	–	
CC-3: Degradation of Wetland Habitat and Ecosystem Health as a Result of Inundation Associated With Sea Level Rise	A, B, C	Beneficial	None required	–
FISH				
Restoration Impacts				
FISH-1: Construction-Related Temporary Impairment of Fish Survival, Growth, and Reproduction by Accidental Spills or Runoff of Contaminants (Heavy Metals)	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
FISH-2: Construction-Related Temporary Reduction of Special-Status Fish Rearing Habitat Quality or Quantity through Increased Input and Mobilization of Sediment	A, B, C	Less than significant	None required	–
FISH-3: Short-Term Impairment of Delta Smelt Passage and Reduced Availability of Spawning and Rearing Habitat Resulting from Changes in Channel Morphology and Hydraulics Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-4: Short-Term Impairment of Chinook Salmon Passage and Reduced Availability of Rearing Habitat Resulting from Changes in Channel Morphology and Hydraulics Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-5: Short-Term Impairment of Steelhead Passage and Reduced Availability of Rearing Habitat Resulting from Changes in Channel Morphology and Hydraulics Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-6: Short-Term Impairment of Green Sturgeon Passage and Reduced Availability of Holding and Rearing Habitat Resulting from Changes in Channel Morphology and Hydraulics Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-7: Short-Term Impairment of Sacramento Splittail Passage and Reduced Availability of Rearing Habitat Resulting from Changes in Velocity Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-8: Short-Term Impairment of Longfin Smelt Passage and Reduced Availability of Rearing Habitat Resulting from Changes in Velocity Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-9: Temporary Reduction of Delta Smelt Habitat Quantity or Quality through Removal and Destruction of Cover Attributable to Restoration Activities	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
FISH-10: Temporary Reduction of Chinook Salmon Habitat Quantity or Quality through Removal and Destruction of Cover as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-11: Temporary Reduction of Steelhead Habitat Quantity or Quality through Removal and Destruction of Cover as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-12: Temporary Reduction of Green Sturgeon Habitat Quantity or Quality as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-13: Temporary Reduction of Sacramento Splittail Habitat Quantity or Quality through Removal and Destruction of Cover as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-14: Temporary Reduction of Longfin Smelt Habitat Quantity or Quality through Removal and Destruction of Cover as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-15: Improved Fish Habitat Due to Increased Dissolved Oxygen Concentrations in Tidal Channels Attributable to Restoration Activities	A, B, C	Beneficial	None required	–
FISH-16: Salinity–Related Reduction of Delta Smelt Survival, Growth, Movement, or Reproduction Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-17: Salinity–Related Reduction of Chinook Salmon Survival, Growth, or Movement as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-18: Salinity–Related Reduction of Steelhead Survival, Growth, or Movement as a Result of Restoration Activities	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
FISH-19: Salinity–Related Reduction of Green Sturgeon Survival, Growth, or Movement as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-20: Salinity–Related Reduction of Sacramento Splittail Survival, Growth, Movement, or Reproduction as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-21: Salinity–Related Reduction of Longfin Smelt Survival, Growth, Movement, or Reproduction as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-22: Disturbance, Injury, or Mortality of Individual Fish Resulting from Work Adjacent to Bodies of Water	A, B, C	Less than significant	None required	–
FISH-23: Change in Fish Species Composition Attributable to Changes in Salinity or Water Quality from Managed or Natural Wetland Modifications	A, B, C	Less than significant	None required	–
FISH-24: Change in Benthic Macroinvertebrate Composition Attributable to Changes in Channel Morphology and Hydraulics as a Result of Tidal Restoration	A, B, C	Less than significant	None required	–
FISH-25: Change in Primary Productivity as a Result of Tidal Restoration	A, B, C	Beneficial	–	–
Managed Wetland Activities Impacts				
FISH-26: Construction-Related Temporary Impairment of Fish Survival, Growth, and Reproduction by Accidental Spills or Runoff of Contaminants (Heavy Metals)	A, B, C	Less than significant	None required	–
FISH-27: Construction-Related Temporary Reduction of Fish Rearing Habitat Quality or Quantity through Increased Input and Mobilization of Sediment	A, B, C	Less than significant	None required	–
FISH-28: Construction-Related Mortality of Fish from Stranding	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
FISH-29: Temporary Reduction of Delta Smelt, Chinook Salmon and Steelhead Habitat Quantity or Quality Attributable to Management Activities	A, B, C	Less than significant	None required	–
FISH-30: Temporary Reduction of Green Sturgeon Habitat Quantity or Quality as a Result of Management Activities	A, B, C	Less than significant	None required	–
FISH-31: Temporary Reduction of Sacramento Splittail Habitat Quantity or Quality as a Result of Management Activities	A, B, C	Less than significant	None required	–
FISH-32: Temporary Reduction of Longfin Smelt Habitat Quantity or Quality as a Result of Management Activities	A, B, C	Less than significant	None required	–
FISH-33: Reduction in Benthic Macroinvertebrate Abundance as a Result of Dredging	A, B, C	Less than significant	None required	–
FISH-34: Disturbance, Injury, or Mortality of Delta Smelt Resulting from Dredging	A, B, C	Less than significant	None required	–
FISH-35: Disturbance, Injury, or Mortality of Chinook Salmon Resulting from Dredging	A, B, C	Less than significant	None required	–
FISH-36: Disturbance, Injury, or Mortality of Steelhead Resulting from Dredging	A, B, C	Less than significant	None required	–
FISH-37: Disturbance, Injury, or Mortality of Green Sturgeon Resulting from Dredging	A, B, C	Less than significant	None required	–
FISH-38: Disturbance, Injury, or Mortality of Sacramento Splittail Resulting from Dredging	A, B, C	Less than significant	None required	–
FISH-39: Disturbance, Injury, or Mortality of Longfin Smelt Resulting from Dredging	A, B, C	Less than significant	None required	–
FISH-40: Reduction of Fish Habitat Quantity or Quality Resulting from Installation of New Riprap on Levees	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
VEGETATION AND WETLANDS				
Restoration Impacts				
VEG-1: Short-Term Loss or Degradation of Tidal Wetlands and Tidal Perennial Aquatic Communities in Slough Channels Downstream of Restoration Sites as a Result of Increased Scour	A, B, C	Less than significant	None required	–
VEG-2: Loss or Degradation of Tidal Wetlands Adjacent to Restoration Sites as a Result of Levee Breaching/Grading	A, B, C	Less than significant	None required	–
VEG-3: Loss of Managed Wetlands as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
VEG-4: Loss of Upland Plant Communities and Associated Seasonal Wetland Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
VEG-5: Spread of Noxious Weeds as a Result of Restoration Construction	A, B, C	Less than significant	None required	–
VEG-6: Loss of Special-Status Plants or Suitable Habitat as Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
VEG-7: Degradation of Native Plant Species and Spread of Invasive Plant Species as a Result of Increased Public Access	A, B, C	Less than significant	None required	–
VEG-8: Loss or Degradation of Tidal Native Plant Species and Spread of Invasive Plant Species as a Result of Tidal Muting	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
VEG-9: Loss of Special-Status Plants or Suitable Habitat as Result of Exterior Levee Activities	A, B, C	Less than significant	None required	–
VEG-10: Loss or Degradation of Wetland Communities and Special-Status Plant Species in Slough Channels as a Result of Channel Dredging	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
VEG-1: Loss or Degradation of Rare Natural Communities and Special-Status Plant Species as a Result of New Fish Screen Facilities	A, B, C	Less than significant	None required	–
VEG-12: Loss or Disturbance of Managed Wetlands as a Result of Activities within Managed Wetlands	A, B, C	Less than significant	None required	–
VEG-13: Loss or Disturbance of Tidal Wetlands or Other Waters of the United States and Special-Status Plant Species as a Result of Placement of New Riprap and Alternative Bank Protection Methods	A, B, C	No impact	–	–
VEG-14: Loss or Disturbance of Wetlands and Special-Status Plant Species as a Result of DWR/Reclamation Facility Maintenance Activities	A, B, C	Less than significant	None required	–
VEG-15: Introduction or Spread of Noxious Weeds as Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILDLIFE				
Restoration Impacts				
WILD-1: Loss or Disturbance of Salt Marsh Harvest Mouse Suitable Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-2: Loss or Disturbance of California Clapper Rail Suitable Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-3: Loss or Disturbance of California Black Rail Suitable Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-4: Loss or Disturbance of Suisun Shrew Suitable Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-5: Loss or Disturbance of California Least Tern Suitable Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
WILD-6: Loss of Suisun Song Sparrow and Salt Marsh Common Yellowthroat Suitable Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-7: Loss or Disturbance of Raptor Nest Sites or Foraging Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-8: Loss or Disturbance of Western Pond Turtle as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-9: Loss or Disturbance of Tricolored Blackbird as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-10: Effects on Southern Resident Killer Whales as a Result of Changes in Salmon Populations	A, B, C	Less than significant	None required	–
WILD-11: Loss or Disturbance of Waterfowl and Shorebird Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
WILD-12: Loss or Disturbance of Salt Marsh Harvest Mouse Suitable Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-13: Loss or Disturbance of California Clapper Rail Suitable Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-14: Loss or Disturbance of California Black Rail Suitable Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-15: Loss or Disturbance of Suisun Shrew Suitable Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
WILD-16: Loss or Disturbance of California Least Tern Suitable Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-17: Loss or Disturbance of Suisun Song Sparrow and Salt Marsh Common Yellowthroat Suitable Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-18: Loss or Disturbance of Raptor Nest Sites or Foraging Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-19: Loss or Disturbance of Western Pond Turtle as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-20: Loss or Disturbance of Tricolored Blackbird as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-21: Effects on Southern Resident Killer Whales as a Result of Changes in Salmon Populations as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-22: Changes in Waterfowl Nesting and Wintering Habitat as a Result of Marsh Management Activities	A, B, C	Beneficial	–	–
WILD-23: Changes in Shorebird Nesting and Wintering Habitat as a Result of Marsh Management Activities	A, B, C	Beneficial	–	–
LAND AND WATER USE				
Restoration Impacts				
LU-1: Alteration of Existing Land Use Patterns	A, B, C	Less than significant	None required	–
LU-2: Conflict with Existing Land Use Plans, Policies, and Regulations	A, B, C	No impact	–	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
LU-3: Conflict with Any Applicable Habitat Conservation Plan or Natural Community Conservation Plan	A, B, C	No impact	–	–
Managed Wetland Activities Impacts				
LU-1: Alteration of Existing Land Use Patterns	A, B, C	Less than significant	None required	–
LU-2: Conflict with Existing Land Use Plans, Policies, and Regulations	A, B, C	No impact	–	–
LU-3: Conflict with Any Applicable Habitat Conservation Plan or Natural Community Conservation Plan	A, B, C	No impact	–	–
SOCIAL AND ECONOMIC CONDITIONS				
Restoration Impacts				
SOC-1: Change in Employment and Income Resulting from Construction, Restoration, and Other Expenditures	A, B, C	Beneficial	–	–
SOC-2: Changes in Employment and Income Resulting from Changes in Managed Wetland–Related Recreation Opportunities and Use	A, B, C	Beneficial	–	–
SOC-3: Changes in Property Tax Revenues as a Result of Purchasing and Restoring Private Lands	A, B, C	Less than significant	–	–
Managed Wetland Activities Impacts				
SOC-1: Change in Employment and Income Resulting from Construction Restoration, and Other Expenditures	A, B, C	Beneficial	–	–
SOC-2: Changes in Employment and Income Resulting from Changes in Managed Wetland–Related Recreation Opportunities and Use	A, B, C	Beneficial	–	–
SOC-4: Changes in Employment and Income Resulting from Increased Expenditures for Wetland Management Activities	A, B, C	Less than significant	–	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
UTILITIES AND PUBLIC SERVICES				
Restoration Impacts				
UTL-1: Damage to Pipelines and/or Disruption of Electrical, Gas, or Other Energy Services during Construction or Restoration Activities	A, B, C	Significant	UTL-MM-1: Relocate Overhead Powerlines or other Utilities that Could be Affected by Construction UTL-MM-2: Avoid Ground-Disturbing Activities within Pipeline Right-of-Way	Less than significant
UTL-2: Damage to Utility Facilities or Disruption to Service as a Result of Restoration	A, B, C	Significant	UTL-MM-3: Relocate or Upgrade Utility Facilities that Could be Damaged by Inundation UTL-MM-4: Test and Repair or Replace Pipelines that Have the Potential for Failure	Less than significant
UTL-3: Reduction in Capacity of Local Solid Waste Landfills	A, B, C	Less than significant	None required	–
UTL-4: Increase in Emergency Service Response Times	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
UTL-3: Reduction in Capacity of Local Solid Waste Landfills	A, B, C	Less than significant	None required	–
UTL-4: Increase in Emergency Service Response Times	A, B, C	Less than significant	None required	–
UTL-5: Damage to Pipelines and/or Disruption of Electrical, Gas, or Other Energy Services during Dredging	A, B, C	Significant	UTL-MM-2: Avoid Ground-Disturbing Activities within Pipeline Right-of-Way	Less than significant
POWER PRODUCTION AND ENERGY				
Restoration Impacts				
POW-1: Substantial Temporary Increase in Energy Use during Construction and Restoration Activities	A, B, C	Less than significant	None required.	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
Managed Wetland Activities Impacts				
POW-2: Substantial Temporary Increase in Energy Use during Managed Wetland Activities	A, B, C	Less than significant	None required.	–
VISUAL/AESTHETIC RESOURCES				
Restoration Impacts				
VIS-1: Temporary Changes in Views Caused by Construction Activities	A, B, C	Less than significant	None required	–
VIS-2: Temporary Changes in Views Caused by Habitat Reestablishment Period	A, B, C	Less than significant	None required	–
VIS-3: Changes in Views to and from Suisun Marsh	A, B, C	Less than significant	None required	–
VIS-4: Damage to Scenic Resources along Scenic Highway	A, B, C	No impact	–	–
VIS-5: Create a New Source of Light and Glare That Affects Views in the Area	A, B, C	Less than significant	None required	–
VIS-6: Conflict with Policies or Goals Related to Visual Resources	A, B, C	No impact	–	–
Managed Wetland Activities Impacts				
VIS-1: Temporary Changes in Views Caused by Construction Activities	A, B, C	Less than significant	None required	–
VIS-3: Changes in Views to and from Suisun Marsh	A, B, C	Less than significant	None required	–
VIS-4: Damage to Scenic Resources along Scenic Highway	A, B, C	No impact	–	–
VIS-5: Create a New Source of Light and Glare That Affects Views in the Area	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
VIS-6: Conflict with Policies or Goals Related to Visual Resources	A, B, C	No impact	–	–
CULTURAL RESOURCES				
Restoration Impacts				
CUL-1: Damage to Montezuma Slough Rural Historic Landscape and Mein's Landing as a Result of Ground-Disturbing Activities along Montezuma Slough	A, B, C	Significant	CUL-MM-1: Document and Evaluate the Montezuma Slough Rural Historic Landscape, Assess Impacts, and Implement Mitigation Measures to Lessen Impacts	Significant and unavoidable
CUL-2: Damage to or Destruction of Other Known Cultural Resources as a Result of Ground-Disturbing Activities in Lowland and Marsh Areas	A, B, C	Significant	CUL-MM-2: Evaluate Previously Recorded Cultural Resources and Fence NRHP- and CRHR-Eligible Resources prior to Ground-Disturbing Activities	Less than significant
CUL-3: Damage to Known Cultural Resources as a Result of Inundation	A, B, C	Significant	CUL-MM-3: Protect Known Cultural Resources from Damage Incurred by Inundation through Plan Design (Avoidance) CUL-MM-4: Resolve Adverse Effects prior to Construction	Significant and unavoidable
CUL-4: Inadvertent Damage to or Destruction of As-Yet-Unidentified Cultural Resources as a Result of Ground-Disturbing Activities in Restoration Areas	A, B, C	Significant	CUL-MM-5: Conduct Cultural Resource Inventories and Evaluations and Resolve Any Adverse Effects	Significant and unavoidable
CUL-5: Damage to or Destruction of Human Remains as a Result of Ground-Disturbing Activities	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
CUL-6: Damage to or Destruction of Shipwrecks or Other Submerged Resources as a Result of Channel Dredging	A, B, C	Significant	CUL-MM-6: Stop Ground-Disturbing Activities, Evaluate the Significance of the Discovery, and Implement Mitigation Measures as Appropriate	Less than significant

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
CUL-7: Damage to or Destruction of Known Cultural Resources Resulting from Managed Wetland Activities	A, B, C	Significant	CUL-MM-7: Complete NHPA Section 106 Consultation and Prepare and Implement Context Study; Evaluate Previously Recorded Cultural Resources and Fence NRHP- and CRHR-Eligible Cultural Resources prior to Ground-Disturbing Activities	Less than significant
CUL-8: Damage to or Destruction of As-Yet-Unidentified Cultural Resources in Uninspected Areas as a Result of Other Ground-Disturbing Managed Wetland Activities	A, B, C	Significant	CUL-MM-8: Complete NHPA Section 106 Consultation and Prepare and Implement Context Study; Conduct Cultural Resources Inventories and Evaluations and Resolve Any Adverse Effects	Significant and unavoidable
PUBLIC HEALTH AND ENVIRONMENTAL HAZARDS				
Restoration Impacts				
HAZ-1: Increased Risk of Mosquito-Borne Diseases	A, B, C	Less than significant	None required	–
HAZ-2: Exposure to or Release of Hazardous Materials during Construction	A, B, C	Less than significant	None required	–
HAZ-3: Release of Hazardous Materials into Surrounding Water Bodies during Construction	A, B, C	Less than significant	None required	–
HAZ-4: In-Channel Construction-Related Increase in Emergency Response Times	A, B, C	Less than significant	None required	–
HAZ-5: Increased Human and Environmental Exposure to Mercury	A, B, C	Less than significant	None required	–
HAZ-6: Reduction in Potential for Catastrophic Flooding	A, B, C	Beneficial	–	–
HAZ-7: Increased Human and Environmental Exposure to Natural Gas and Petroleum	A, B, C	Significant	UTL-MM-2: Avoid Ground-Disturbing Activities within Pipeline Right-of-Way UTL-MM-3: Relocate or Upgrade Utility Facilities That Could Be Damaged by Inundation UTL-MM-4: Test and Repair or Replace Pipelines That Have the Potential for Failure	Less than significant

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
Managed Wetland Activities Impacts				
HAZ-2: Exposure to or Release of Hazardous Materials during Construction	A, B, C	Less than significant	None required	–
HAZ-4: In-Channel Construction-Related Increase in Emergency Response Times	A, B, C	Less than significant	None required	–
HAZ-5: Increased Human and Environmental Exposure to Mercury	A, B, C	Less than significant	None required	–
HAZ-6: Reduction in Potential for Catastrophic Flooding	A, B, C	Beneficial	–	–
ENVIRONMENTAL JUSTICE				
Restoration Impact				
EJ-1: Disproportionate Impact of Management of Suisun Marsh on Minority and/or Low-Income Communities	A, B, C	No impact	–	–
Managed Wetland Activities Impact				
EJ-1: Disproportionate Impact of Management of Suisun Marsh on Minority and/or Low-Income Communities	A, B, C	No impact	–	–
INDIAN TRUST ASSETS				
No Impacts				

Chapter 1
Introduction, Purpose, and Need

Introduction

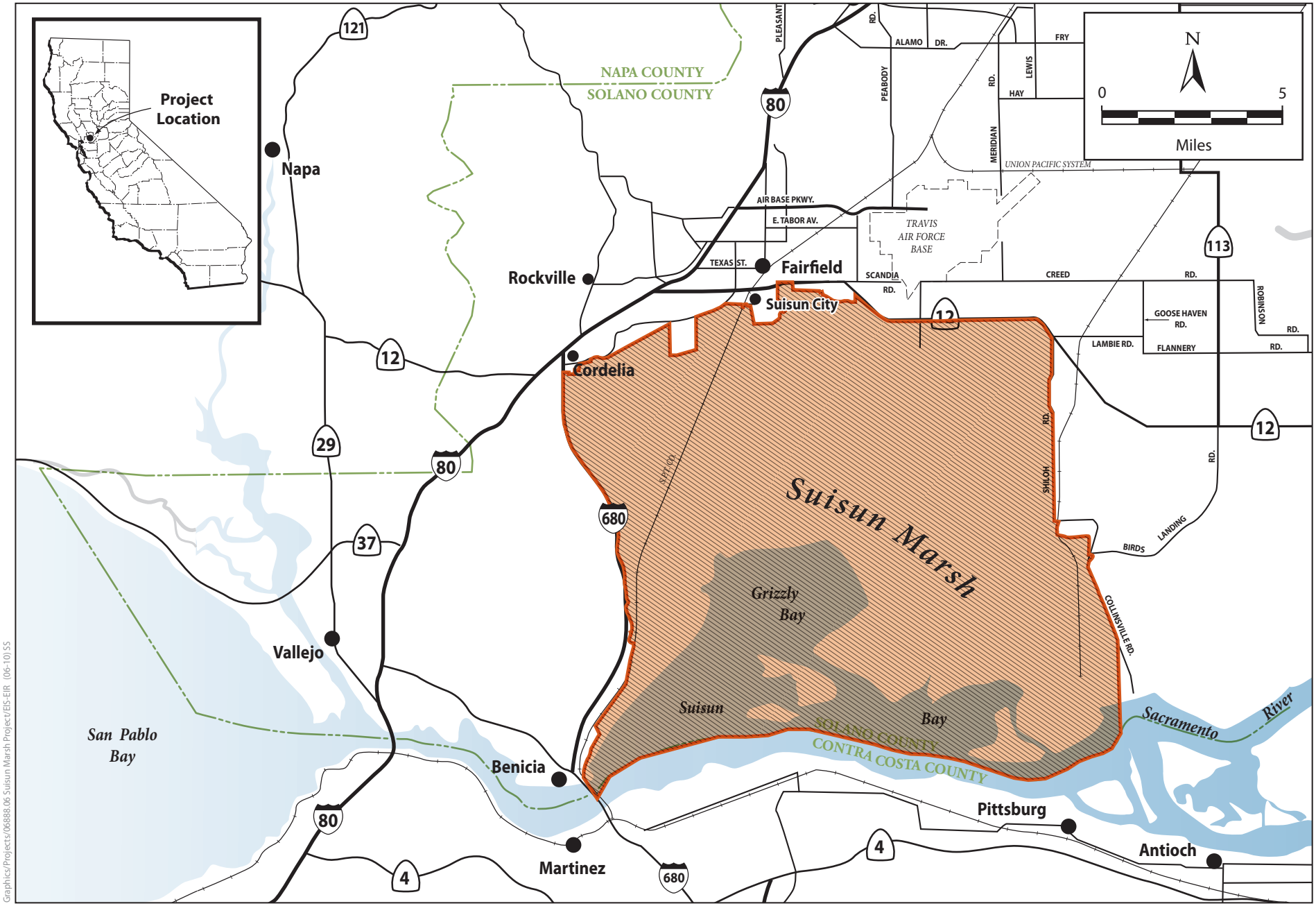
Suisun Marsh is the largest contiguous brackish water marsh remaining on the west coast of North America and is a critical part of the San Francisco Bay/Sacramento–San Joaquin River Delta (Bay-Delta) estuary ecosystem. The Marsh encompasses more than 10 percent of California's remaining natural wetlands and serves as the resting and feeding grounds for thousands of birds migrating on the Pacific Flyway and resident waterfowl. In addition, the Marsh provides important habitat for more than 221 bird species, 45 mammalian species, 16 different reptile and amphibian species, and more than 40 fish species. Suisun Marsh supports the state's commercial salmon fishery by providing important tidal rearing areas for juvenile fish. Approximately 200 miles of levees in the Marsh contribute to managing salinity in the Sacramento–San Joaquin River Delta (Delta). It is home to public waterfowl hunting areas and 158 private duck clubs. The Marsh's large open space and proximity to urban areas make it ideally suited for wildlife viewing, hiking, canoeing, and other recreation opportunities. Figure 1-1 shows the location of Suisun Marsh.

The values of the Marsh have been recognized as important, and several agencies have been involved in its protection, since the mid-1970s. In 1974 the Nejedly-Bagley-Z'Berg Suisun Marsh Preservation Act was enacted by the California Legislature to protect the Marsh from urban development. It required the California Department of Fish and Game (DFG) and the San Francisco Bay Conservation and Development Commission (BCDC) to develop a plan for the Marsh and called for various restrictions on development in the Marsh boundaries. In 1976, the BCDC developed the Suisun Marsh Protection Plan (SMPP), which defined and limited development within the primary and secondary management area for the "future of the wildlife values or the area as threatened by potential residential, commercial, and industrial development." The primary management area consists of tidal marshes, seasonal marshes, managed wetlands, and lowland grasslands within the Marsh. The secondary management area comprises upland grasslands and agricultural lands, which provide significant buffer habitat to the Marsh (Solano County 2008). Figure 1-2 shows the primary and secondary management zones in the Marsh. The SMPP objectives are "to preserve and enhance the quality and diversity of the Suisun Marsh aquatic and wildlife habitats and to assure retention of upland areas adjacent to the Marsh in uses compatible with its protection." The SMPP calls

for the preservation of Suisun Marsh; preservation of waterfowl habitat; improvement of water distribution and levee systems; and encouraging agriculture that is consistent with wildlife and waterfowl, such as grazing. In 1977, the California Legislature implemented Assembly Bill (AB) 1717, the Suisun Marsh Preservation Act of 1977, which replaced the 1974 Suisun Marsh Preservation Act and calls for the implementation of the SMPP; designates BCDC as the state agency with jurisdiction over the Marsh; and calls for Suisun Resource Conservation District (SRCD) to have the primary local responsibility for water management on privately owned lands in the Marsh. In 1984, the California Department of Water Resources (DWR) with cooperation from SRCD, DFG, and U.S. Department of the Interior, Bureau of Reclamation (Reclamation), published the Plan of Protection for Suisun Marsh, in response to State Water Resources Control Board (State Water Board) Water Rights Decision 1485 (D-1485), Order 7 (California Department of Water Resources 1984). The Plan of Protection was a proposal for staged implementation of a combination of activities, including monitoring, a wetlands management program for landowners, physical facilities, and supplemental releases of State Water Project (SWP) and Central Valley Project (CVP) reservoirs. With this staged implementation approach, each action would be evaluated to determine whether subsequent actions were needed. The Initial Facilities and the Suisun Marsh Salinity Control Gates (SMSCG) were constructed and continue to be operated.

In 1987, Reclamation, DWR, DFG, and SRCD signed the Suisun Marsh Preservation Agreement (SMPA), which contains provisions for Reclamation and DWR to mitigate the adverse effects on Suisun Marsh channel water salinity from the SWP and CVP operations and other upstream diversions. It required Reclamation and DWR to meet salinity standards as specified in the then-current State Water Board D-1485, set a timeline for implementing the Plan of Protection for the Suisun Marsh, and delineated monitoring and mitigation requirements. Additional detail about the SMPA and how it relates to the Suisun Marsh Habitat Management, Preservation and Restoration Plan (SMP) is discussed later in this chapter.

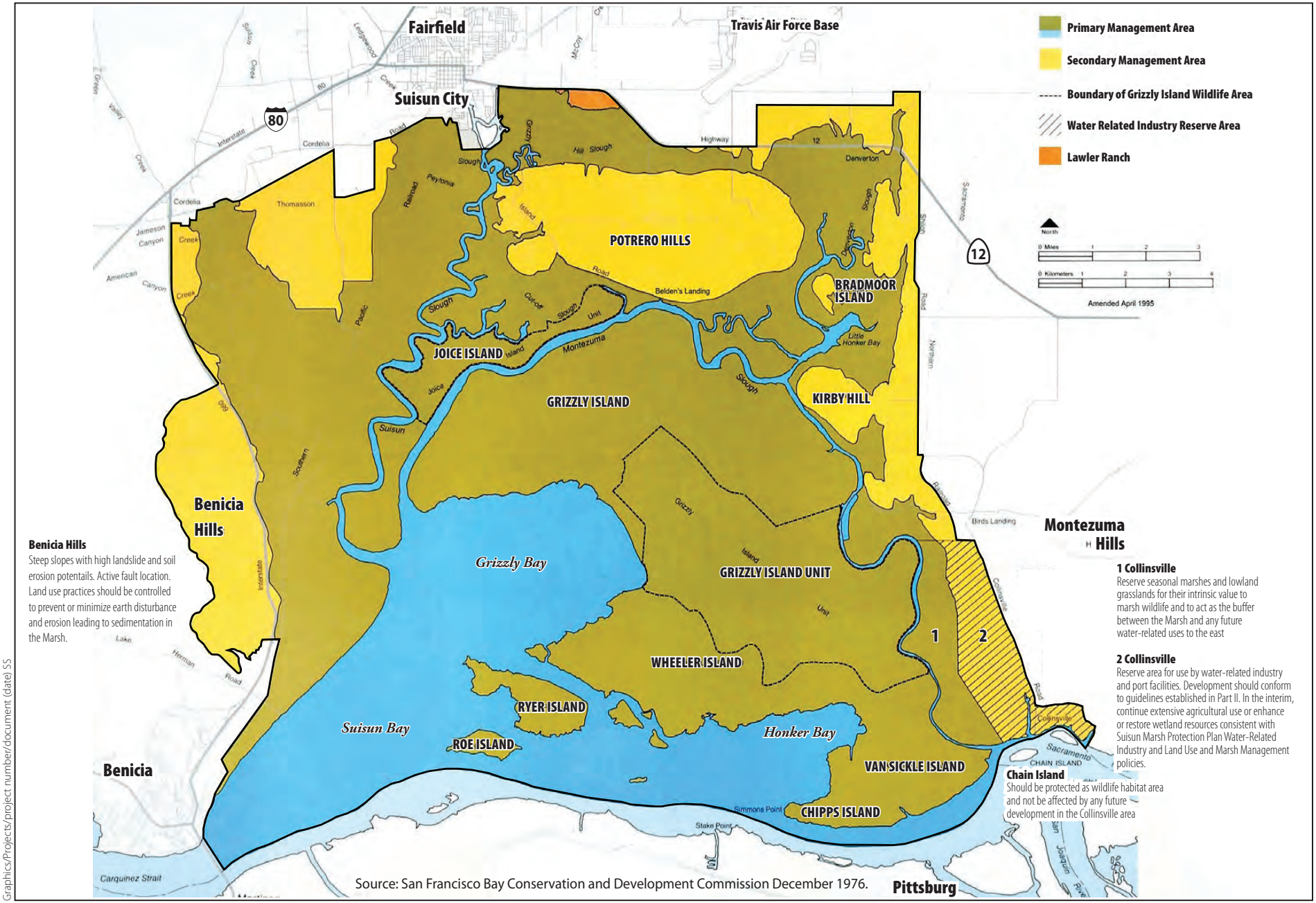
In 2000, the CALFED Bay-Delta Program (CALFED) Record of Decision (ROD) was signed, which established the Ecosystem Restoration Program (ERP) calling for the restoration of 5,000 to 7,000 acres of tidal wetlands and the protection and enhancement of 40,000 to 50,000 acres of managed wetlands for Stage 1 implementation (CALFED Bay-Delta Program 2000a). In 2001, the CALFED agencies were directed to work with key entities involved with Suisun Marsh to form a charter group to develop a plan for Suisun Marsh that would balance the needs of CALFED, the SMPA, and other plans by protecting and enhancing existing land uses and existing waterfowl and wildlife values, including those associated with the Pacific Flyway, endangered species, and state and federal water project supply quality. The charter group includes all of the local, state, and federal agencies that have jurisdiction or interest in the Marsh. However, the SMP has been developed by a subset of the charter group, the Principal Agencies.



Graphics/Projects/06888.06 Suisun Marsh Project/EIS-EIR (06-10) SS

ICF INTERNATIONAL

Figure 1-1
Project Location



Source: San Francisco Bay Conservation and Development Commission December 1976.

Graphics/Projects/project number/document (date) SS

ICF INTERNATIONAL

Figure 1-2
Suisun Marsh Protection Plan Map

The Principal Agencies are the U.S. Fish and Wildlife Service (USFWS); Reclamation; National Marine Fisheries Service (NMFS); DFG; DWR; SRCD, representing the interests of private landowners; and the California Bay-Delta Authority (CBDA). The Principal Agencies have consulted with other participating charter agencies, such as the U.S. Army Corps of Engineers (Corps), BCDC, and the State Water Board, in developing the SMP.

CBDA was created in 2003 as the governing entity for implementation of CALFED by the California Bay-Delta Authority Act. The Sacramento–San Joaquin Delta Reform Act of 2009 (Act) created the Delta Stewardship Council (Council), disbanded the CBDA, and transferred CBDA's CALFED responsibilities to the Council. The Act also created a Delta Conservancy, which is tasked with implementing ecosystem restoration and other actions in the Delta and Suisun Marsh. CBDA participated as a Principal Agency in the development of the SMP through the public draft. The future relationship between the Principal Agencies and the Council or Delta Conservancy is under development.

Each Principal Agency will use this Environmental Impact Statement/ Environmental Impact Report (EIS/EIR) to adopt particular actions described in the document related to their jurisdiction and will contribute to the overall implementation of the SMP. Overall, the SMP is intended to balance the benefits of tidal wetland restoration with other habitat uses, including managed wetlands, in the Marsh by providing a plan for an acceptable change in Marsh-wide land uses. This EIS/EIR describes three alternative 30-year plans, and the adopted alternative will become the SMP. For purposes of this document, Reclamation and USFWS are the joint National Environmental Policy Act (NEPA) lead agencies, and DFG is the California Environmental Quality Act (CEQA) lead agency. Each Principal Agency's action related to the SMP is shown in Table 1-1. It is important to note that Principal Agencies and other agencies or organizations may choose to implement additional restoration and other activities beyond what is described in this SMP. The SMP provides a mechanism to accomplish restoration through use of this EIS/EIR and associated permits when applicable.

Table 1-1. Principal Agencies' Regulatory Actions Related to the Suisun Marsh Plan

	USFWS	Reclamation	DFG	DWR	SRCD	NMFS	CALFED/ CBDA
Restoration	NEPA Lead Programmatic BO	N/A	CEQA Lead	CEQA Responsible	CEQA Responsible	Programmatic BO EFH Conservation Recommendations	Science Integration
Managed Wetland Activities	BO	NEPA Lead	CEQA Responsible CESA Permit Streambed Alteration Agreement	CEQA Responsible	CEQA Responsible	BO EFH Conservation Recommendations	N/A
Preservation Agreement Implementation Fund	BO	NEPA Lead	CEQA Lead	CEQA Responsible	CEQA Responsible	BO EFH Conservation Recommendations	N/A

BO = biological opinion.
CALFED = CALFED Bay-Delta Program.
CBDA = California Bay-Delta Authority.
CESA = California Endangered Species Act.
DFG = California Department of Fish and Game.
DWR = California Department of Water Resources.
N/A = not applicable.
NMFS = National Marine Fisheries Service.
PAI = Preservation Agreement Implementation.
Reclamation = U.S. Department of the Interior, Bureau of Reclamation.
SRCD = Suisun Resource Conservation District.
USFWS = U.S. Fish and Wildlife Service.

Scope and Intent of This Environmental Impact Statement/Environmental Impact Report

This document is a joint EIS/EIR that satisfies the requirements of NEPA and CEQA. NEPA and CEQA require that, prior to project approval, the potential environmental impacts are disclosed and mitigation measures or alternatives are recommended to mitigate certain types of impacts related to the proposed project. This EIS/EIR will provide the necessary information for Reclamation and USFWS to approve and implement the SMP in compliance with NEPA, and DFG to approve and implement the SMP in compliance with CEQA. It is also expected to be used by other federal agencies, considered cooperating agencies under NEPA, and will be used by state and local agencies, considered responsible agencies under CEQA, to make approvals of the SMP in compliance with NEPA and CEQA, as required. As specific actions are proposed as part of implementation of the SMP, the implementing and/or approving federal, state,

and local agencies will be required to ensure that the impacts of those actions are evaluated per the requirements of NEPA and/or CEQA. These future phases of NEPA and CEQA compliance may rely solely on the SMP EIS/EIR or may require additional NEPA and/or CEQA compliance, possibly including the preparation of a supplemental EIS or EIR. State CEQA Guidelines Sections 15162 through 15164 describes the circumstances under which an agency would be required to prepare a subsequent EIR, or a supplement or addendum to the EIR. Likewise, the Council on Environmental Quality's (CEQ's) NEPA Regulations (40 Code of Federal Regulations [CFR] 15029[c][1]) describe when a federal agency would be required to prepare a supplement to the EIS. Although CEQA contains more specificity on when a subsequent or supplement to the EIR is required than NEPA contains for supplements to the EIS, these conditions are generally the same for CEQA and NEPA.

The decision to prepare additional CEQA and/or NEPA compliance documents would be made on a case-by-case basis. It may be likely that during implementation of the SMP, many activities will not require additional CEQA and/or NEPA documentation beyond the SMP EIS/EIR. Additionally, not all future SMP activities will involve agencies subject to both CEQA and NEPA, and future activities therefore may require additional documentation subject to either CEQA or NEPA, but not both. The specific CEQA and/or NEPA documentation, if any, for implementation of the SMP would be determined by several factors, including the extent to which impacts and feasible mitigation and alternatives were evaluated in this EIS/EIR relative to the specificity of the proposed project, special circumstances or changes in circumstances such as the listing of a species under the federal Endangered Species Act (ESA) or California Endangered Species Act (CESA), and activities outside the scope of this EIS/EIR.

Under NEPA and CEQ's NEPA regulations (40 CFR 1500 *et seq*.), federal agencies are required to evaluate the environmental effects of an action, including feasible alternatives, and identify mitigation measures to minimize adverse effects when they propose to carry out, approve, or fund a project that may have a significant effect on the environment.

Three action alternatives for the SMP were selected to be analyzed in this EIS/EIR based on a rigorous alternatives screening and selection process (refer to Chapter 2, "Alternatives Development and Screening"). These alternatives vary in the number of acres that would be restored to tidal wetlands and managed wetlands enhanced. The CALFED Preferred Program Alternative provides the foundation of this acreage range (CALFED Bay-Delta Program 2000c: 149).

The following sections describe the SMP's relationship to CALFED and other ongoing regional programs, purpose and objectives of the SMP, need for the SMP, and background discussion supporting the purpose of and need for the plan. NEPA requires identification of the SMP purpose of and need for the plan, and CEQA requires identification of the objectives. The plan purpose/objectives and need are key criteria used in developing a reasonable range of plan alternatives.

NEPA Cooperating Agencies

NEPA requires that the lead agencies coordinate with federal, state, local, or tribal agencies that have a jurisdiction or special expertise related to the project. For the SMP, NMFS and the Corps are NEPA cooperating agencies. NMFS has participated as a Principal Agency throughout the development of the plan. This participation has included input from NMFS regarding the project description and the scope and content of the analysis. The Corps also has been a cooperating agency through participation in Charter Group meetings, regulatory workgroup meetings, and other meetings intended to solicit input from them regarding wetland resource issues and permitting approaches.

CEQA Responsible and Trustee Agencies

This EIS/EIR will be used by CEQA lead, responsible, and trustee agencies to determine the effects of the proposed plan. Responsible agencies are those that have a responsibility for carrying out or approving the plan. These agencies will rely on the lead agency's environmental document in acting on the aspect of the plan that requires each agency's approval but must prepare and issue its own findings regarding the project (State CEQA Guidelines Section 15096). As such, each agency's use of this document is limited to actions taken under its jurisdiction as described below. Trustee agencies are those that have jurisdiction over certain resources held in trust for the people of California but do not necessarily have legal authority over approving or carrying out the project. For the SMP, DFG serves as lead, responsible, and trustee agency. Responsible and trustee agencies for the SMP are shown in Table 1-2.

Table 1-2. Responsible and Trustee Agencies

Agency	Jurisdiction
Lead	
California Department of Fish and Game	Largest landowner in the Marsh; conservation, protection, and management of wildlife, native plants, and habitat necessary to maintain biologically sustainable populations; habitat restoration
Trustee	
State Lands Commission	State-owned "sovereign" lands
California Department of Fish and Game	Impacts on fish and wildlife of the state, rare and endangered native plants, wildlife areas, and ecological reserves
Responsible	
California Department of Fish and Game	Streambed alteration and impacts on state-listed species
Office of Historic Preservation	Historic and cultural resources
California Department of Water Resources	Delta Levees Program; SMPA funding; water management facilities
Suisun Resource Conservation District	Managed wetland management
California Air Resources Board	Air quality
Regional Water Quality Control Board (#5)	Pollutant discharges to water bodies
Bay Conservation and Development Commission	Dredging; any development activity that occurs below the 10-foot contour level
Solano County	Construction

SMPA = Suisun Marsh Preservation Agreement.

Need for Action

The SMP is a comprehensive plan designed to address the various conflicts regarding use of Marsh resources, with the focus on achieving an acceptable multi-stakeholder approach to the restoration of tidal wetlands and the management of managed wetlands and their functions. As such, the SMP is intended to be a flexible, science-based, management plan for Suisun Marsh, consistent with the revised SMPA and CALFED. It also is intended to set the regulatory foundation for future actions. The need for the action is based on the following major Marsh resources and functions. Each Principal Agency has particular roles in implementation of the SMP as described in Table 1-1.

Habitats and Ecological Processes

The conversion of tidal wetlands as a result of diking resulted in a loss of habitat for many species, including those now listed as threatened or endangered. Development in areas surrounding the Marsh has resulted in introduction and spread of nonnative species, fish entrainment issues, and degradation of water quality. Additionally, there have been water quality effects from drainage operations in managed wetlands. While taking appropriate steps to restore the ecological values of historical tidal wetland habitat, efforts will be made to improve management of managed wetlands and to lessen adverse effects from development, nonnative species, and detrimental land use practices in the secondary management areas and adjacent metropolitan areas.

Public and Private Land Use

Managed wetlands, tidal wetlands, and uplands, whether publicly or privately owned, provide important wetlands for migratory waterfowl and other resident and migratory wetland-dependent species and opportunities for hunting, fishing, bird watching, and other recreational activities. There is a need to maintain these opportunities as well as improve public stewardship of the Marsh to ensure that the implementation of restoration and managed wetland activities is understood and valued for both public and private land uses.

Levee System Integrity

Of the more than 200 miles of exterior levees in Suisun Marsh, only about 20 miles along Suisun, Grizzly, and Honker Bays (authorized through AB 360) receive public funding. Additionally, as restoration actions are implemented, some interior levees will be converted to exterior levees and will require reinforcement and more maintenance, and in some instances significant upgrades. Because of current restrictions preventing dredging from sloughs and constraints on importing materials, landowners in the Marsh have maintained their exterior levees using primarily material from ditch cleaning or pond bottom grading for more than a decade, a practice that increases subsidence and potentially weakens the existing levee foundations. These factors combined have exhausted the supply of levee maintenance material in the managed wetlands and have forced maintenance to be deferred on some exterior levees, increasing the risk of catastrophic flooding.

Water Quality

Multiple factors contribute to the water quality in Suisun Marsh, including upstream diversion, reduced Delta outflow, state and federal water project operations and diversions, drainage practices in managed wetlands, minimal tidal

exchange in dead-end sloughs, urban runoff, erosion, agricultural runoff, discharge from the Fairfield Suisun Sewer District treatment plant to Boynton Slough, and remnant contaminants such as mercury. Improvement of water quality and management practices will benefit the ecological processes for all habitats, including managed and tidal wetlands.

More detail on the need for the SMP is provided below.

Plan Purposes/Objectives

The SMP is intended to address the full range of issues in the Marsh, as described in the Need for Action section above. As such, the SMP purposes/objectives are divided by topic but are linked geographically, ecologically, and socially. The plan purposes/objectives are:

- **Habitats and Ecological Processes—**implement the CALFED Ecosystem Restoration Program Plan (ERPP) restoration target for the Suisun Marsh ecoregion of 5,000 to 7,000 acres of tidal marsh and protection and enhancement of 40,000 to 50,000 acres of managed wetlands;
- **Public and Private Land Use—**maintain the heritage of waterfowl hunting and other recreational opportunities and increase the surrounding communities' awareness of the ecological values of Suisun Marsh;
- **Levee System Integrity—**maintain and improve the Suisun Marsh levee system integrity to protect property, infrastructure, and wildlife habitats from catastrophic flooding; and
- **Water Quality—**protect and, where possible, improve water quality for beneficial uses in Suisun Marsh, including estuarine, spawning, and migrating habitat uses for fish species as well as recreational uses and associated wildlife habitat.

The SMP requires that these interrelated and interdependent purposes/objectives be implemented to some extent through all SMP actions. For example, the levee system integrity purpose/objective would ensure that managed wetlands are protected from catastrophic flooding, thus contributing to meeting the portion of the habitats and ecological processes purpose/objective that addresses protection of managed wetlands. Similarly, the restoration of certain properties may help protect and/or improve water quality, and achieving the habitats and ecological processes purpose/objective also would help to achieve the private and public land use purpose/objective. Recognizing these relationships, the SMP is proposed to contribute to meeting each of them in parallel over the 30-year planning period.

Suisun Marsh Regions

For purposes of this analysis, the Marsh has been divided into four regions. This division allows for a more specific characterization of potential actions and their impacts, and also provides direction related to the massing of restoration in any given area of the Marsh. Areas within each region are hydrologically and geographically linked as described below. Chapter 2 describes how restoration would be accomplished in each region and the Resource Management Associates (RMA) model used for determining water quality and tidal hydraulic impacts was based on these regions as described in Sections 5.1 and 5.2. The four regions are shown in Figure 1-3 and are described below.

Region 1

Region 1 consists of the western and northwestern portions of Suisun Marsh, primarily west of or adjacent to the Union Pacific Railroad. Managed wetland units diverting from, and draining into, medium to small tidal sloughs characterize this area of the Marsh. Some of these tidal sloughs are influenced significantly by freshwater inflow from the Green Valley, Suisun, and Ledgewood Creeks. Additionally, there are several dead-end sloughs in this region of the Marsh in which complete tidal exchange is minimal. The Fairfield Suisun Sewer District treatment plant discharges wastewater (a freshwater source) primarily into Boynton Slough and some managed wetlands in this region.

Region 2

Region 2 is the central portion of the Marsh, fronting Suisun and Cutoff Sloughs and a small portion of Montezuma Slough. This region of the Marsh is characterized as managed wetland areas that flood off of a mix of small to large tidal sloughs and drain primarily into Suisun Slough, the second largest tidal slough in the Marsh, or Montezuma Slough. Suisun Slough is similar to Montezuma, a large, highly energetic channel terminating at Grizzly Bay running north into the interior heart of the Marsh. Rush Ranch, the largest remnant tidal wetland in the Marsh, and Upper and Lower Joice Islands also are included in this region. The Fairfield Suisun Sewer District treatment plant discharges wastewater (a freshwater source) primarily into Boynton Slough, which is on the northern boundary of Region 2.

Region 3

The northeastern portion of Suisun Marsh is characterized by Little Honker Bay and minor sloughs such as Nurse, Denverton, and Luco Sloughs. Managed

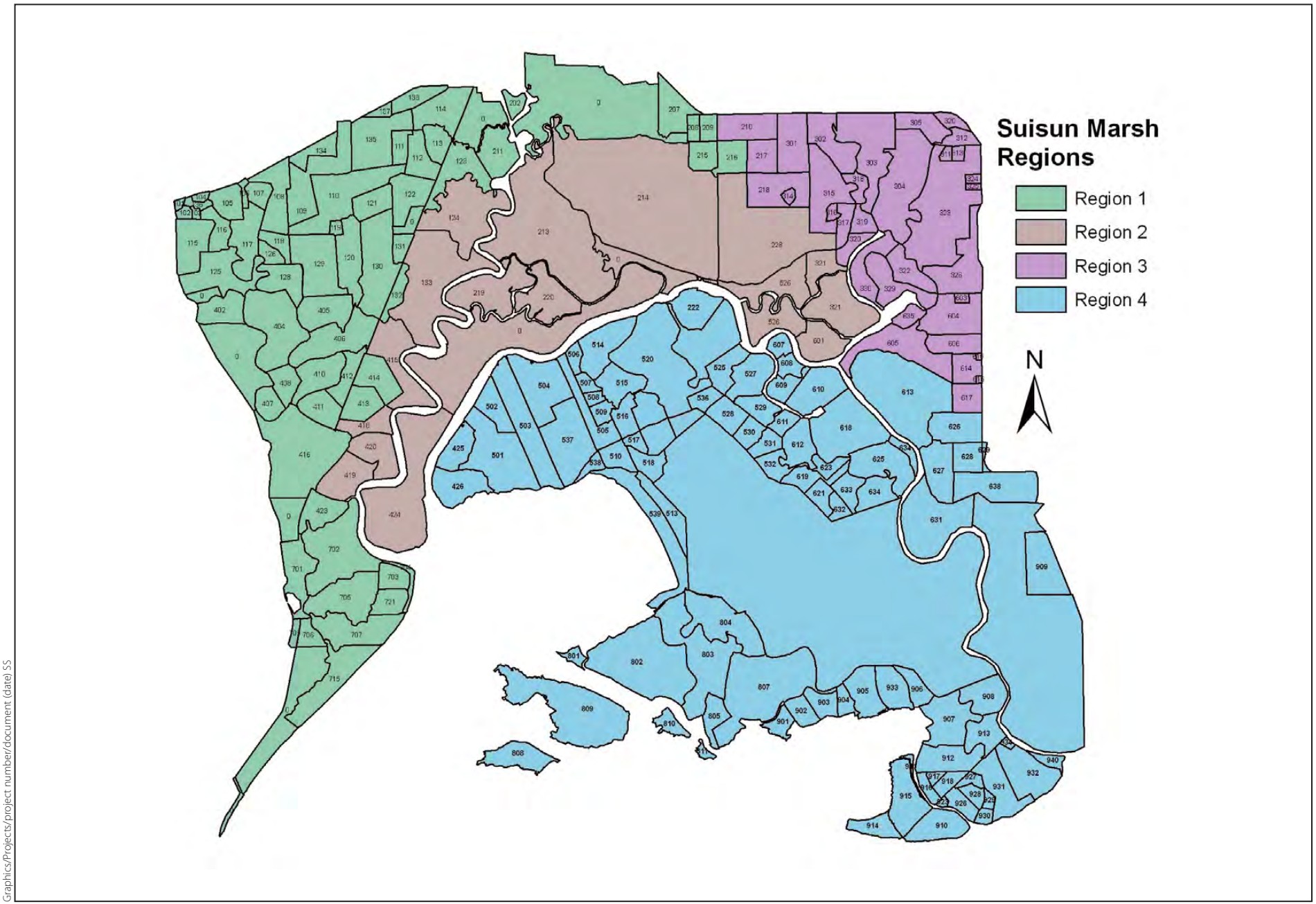


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Figure 1-3
Suisun Marsh Regions

wetland units flood and drain primarily into fairly large to medium-sized tidal sloughs and Little Honker Bay in this area of the Marsh.

Region 4

This is the central and southern portion of Suisun Marsh and represents the largest geographic region of the Marsh. This area includes Grizzly Island (which includes Van Sickle, Hammond, Simmons, and Wheeler Islands), Chipps Island, Ryer, Roe, and several smaller islands in Suisun Bay. Montezuma Slough, the Sacramento and San Joaquin Rivers, and Grizzly, Suisun, and Honker Bays hydrologically dominate this area. All of these channels and bays are highly energetic with enormous daily movements of water driven by tides, Delta outflow, wind, and the SMSCG. This region of the Marsh has had significant investment in fish screen facilities over the last 15 years, and more than 19,958 acres of managed wetlands have access to water that is screened. Some properties that have access to screened water cannot meet all of their needs with available screened water, but this is the primary water source. Screened water is depended upon in the spring when diversion restrictions are in place (i.e., diversion reductions or mandatory closures).

The presence of numerous fish-screened facilities, including the Roaring River Distribution System (RRDS), has supported historical management strategies of these managed wetlands. The other regions of the Marsh without fish screens have had to modify managed wetland strategies to accommodate restrictions to protect fish at unscreened diversions. Almost all of these wetland areas obtain their water from Montezuma Slough and drain to the bays if physically possible. If not, the wetland areas drain directly into the large tidal sloughs.

Plan Background

As briefly described above, Suisun Marsh has a long and complex management history involving multiple stakeholders. The following sections highlight major components of this history and the various ecological, recreational, and other resources in the Marsh related to the need for and purposes/objectives of the SMP.

History of Suisun Marsh Management

The historical management of the Marsh includes changed regulatory and institutional conditions, construction of new facilities and changes to existing facilities, and legislative changes; several important changes are listed in Table 1-3 below. Chapter 10, “Compliance with Applicable Laws, Policies, and Plans and Regulatory Framework,” contains a more detailed discussion of each of these actions.

Table 1-3. Changes in Management of Suisun Marsh

Action	Year	Description
4-Agency Memorandum of Agreement	1970	Called for studies necessary to obtain a thorough understanding of the requirements of fish and wildlife resources and evaluate alternative means of providing substitute freshwater supplies that would enable protection and enhancement of Suisun Marsh waterfowl habitat.
The Nejedly-Bagley-Z'Berg Suisun Marsh Preservation Act	1974	Required the BCDC and DFG to develop a plan for the protection of the Marsh and provides various restrictions on development within Marsh boundaries.
Suisun Marsh Protection Plan, The Suisun Marsh Preservation Act of 1977 (AB 1717)	1976, 1977	Adopted the Suisun Marsh Protection Plan, which defines and limits development in primary and secondary management areas (Figure 1-2), designates the BCDC as the state agency with regulatory jurisdiction of the Marsh, and calls for the SRCD to have responsibility for water management in the Marsh.
State Water Resources Control Board Water Rights Decision 1485	1978	Set water quality standards and required DWR and Reclamation to develop and fully implement a plan to meet the standards for the Marsh.
Plan of Protection for Suisun Marsh	1984	Prepared by DWR and Reclamation in response to D-1485. Included construction of large facilities and distribution systems in six phases to meet salinity standards. Two of the six phases were completed, including the Initial Facilities, establishment of water quality monitoring stations, and the Suisun Marsh Salinity Control Gates.
SMPA	1987	A contractual agreement among DWR, Reclamation, DFG, and SRCD. Requires DWR and Reclamation to meet salinity standards, sets a timeline for implementing the Plan of Protection for Suisun Marsh, and delineates monitoring and mitigation requirements.
Bay-Delta Accord	1994	State and federal agencies, working with agricultural, environmental, and urban stakeholders, reached agreement on water quality standards and related provisions that would remain in effect for 3 years.
State Water Board Water Quality Control Plan	1995–1998	Modified Delta Flow Standards. Modeling analysis by the Suisun Marsh Planning Program showed that Suisun Marsh standards would be met most of the time at all Suisun Marsh compliance stations. Some standard exceedances would be expected in the western Marsh that participants to the SMPA agreed could be mitigated by implementing the PAI fund and actions for more active water control by landowners.
Suisun Ecological Workgroup	1995	The 1995 Water Quality Control Plan recommended that DWR convene the multi-agency SEW to evaluate the beneficial uses and establish water quality objectives in the Marsh. The State Water Board asked for specific measures to implement the narrative objectives for the Marsh in the 1995 WQCP.
Environmental Coordination Advisory Team	1998	ECAT was convened to ensure compliance with conditions, mitigation, and monitoring responsibilities specified in the SMPA as well as biological opinions. ECAT includes staff from Reclamation, DFG Grizzly Island Wildlife Area, DFG Central Valley Bay-Delta Branch, SRCD, and DWR. The USFWS, NMFS, and Corps staffs have participated in an advisory role.
State Water Board Water Right Decision 1641	1999	Increased outflow and set salinity requirements for the Bay-Delta, which provided indirect benefits to Suisun Marsh. State Water Board relieved Reclamation and DWR of responsibility in meeting numerical salinity objectives at S-35 and S-97 in the western Marsh.

Action	Year	Description
CALFED Suisun Marsh Charter	2000	Intended to develop a plan for the management of the various resources in the Marsh in compliance with the many regulatory requirements already in place.
Revised SMPA	2005	Actions included an agreement to meet channel water salinity standards in D-1641, convert S-35 and S-97 from compliance stations to monitoring stations, implement a Water Manager Program, provide portable drainage pumps, realign and stabilize Roaring River Distribution System turnouts, and establish a Drought Response Fund.

AB	=	Assembly Bill.
BCDC	=	San Francisco Bay Conservation and Development Commission.
Corps	=	U.S. Army Corps of Engineers.
D-1485	=	State Water Board water right Decision 1485.
D-1641	=	State Water Board water right Decision 1641
DFG	=	California Department of Fish and Game.
DWR	=	California Department of Water Resources.
ECAT	=	Environmental Coordination and Advisory Team.
NMFS	=	National Marine Fisheries Service.
Reclamation	=	U.S. Department of the Interior, Bureau of Reclamation.
SEW	=	Suisun Ecological Workgroup.
SMPA	=	Suisun Marsh Preservation Agreement.
SRCD	=	Suisun Resource Conservation District.
State Water Board	=	State Water Resources Control Board.
USFWS	=	U.S. Fish and Wildlife Service.
1995 WQCP	=	1995 Water Quality Control Plan for the San Francisco Bay/San Joaquin Delta Estuary.

Habitat Management

Since the mid-1990s, ecological goals and the focus of Suisun Marsh land use by some public agencies have transitioned from species- to habitat-based conservation goals, including increased interest in restoring more tidal wetlands in Suisun Marsh and other parts of the estuary. Historically, Suisun Marsh contained more than 60,000 acres of brackish tidal wetlands. Waterfowl hunting began in the 1850s. Construction of levees began around 1865, initially to enable livestock grazing but later for farming. Today approximately 7,672 acres of tidal wetlands remain, and property is held by both private and public entities as shown in Figure 1-4. The changes in land use resulted in a loss of habitat for tidal marsh–dependent species and fragmentation of the remaining tidal wetlands.

Suisun Marsh plays an important role in providing suitable habitat for the first waterfowl arriving from the north and resident waterfowl, and at times is the only habitat available until the Sacramento–San Joaquin Valley and Delta agricultural fields are flooded. Managed wetlands also provide habitat for many species of shorebirds and other birds. For example, more than 20 species of shorebirds occur in Suisun Marsh along with many species of hawks, owls, and songbirds. Some of the mammal species that occur in Suisun Marsh are river otter, tule elk, and salt marsh harvest mouse.

Current land use in the Marsh is a mixture of privately and state-managed lands, with approximately 52,112 acres of diked baylands managed mainly as wetlands. State and private landowners collaborate to achieve a wide degree of management goals, including those to protect tidal wetlands, managed wetlands, grazing, and recreational use, and to provide flood protection and mosquito control.

Tidal Wetlands

Tidal wetlands are composed of vegetated marsh plains and intertidal and subtidal channels that provide important habitat for a variety of endangered and sensitive species. Vegetated tidal marsh plains are typically at elevations between local mean high water and slightly above mean higher high water. Marsh channels, both the deeper "subtidal" channels and the shallower "intertidal" channels, provide important aquatic habitat for fish species such as delta smelt, longfin smelt, Sacramento splittail, and salmonids. The channel edges of tidal wetlands, which provide exposed beds and banks at lower tide stages, provide foraging habitat for California clapper rail along with many other bird species. The tidal marsh plains provide habitat for native plant species such as soft bird's-beak and Suisun thistle and breeding, forage, and roosting habitats for passerine birds such as Suisun song sparrow and tri-colored blackbirds.

There are currently approximately 7,700 acres of tidal wetland in Suisun Marsh, which include areas that are remnant historical tidal wetlands and restored tidal wetlands.

Diked Managed Wetlands

Suisun Marsh has approximately 52,112 acres of diked managed wetlands and uplands. These lands are managed primarily for wintering waterfowl but also provide important habitat for many resident and migratory species such as the salt marsh harvest mouse, tule elk, and Pacific Flyway birds. Most diked wetlands are managed as seasonal wetlands with a small amount managed as perennial wetlands. The diked managed wetlands are divided between private and public ownership. Approximately 37,500 acres (158 parcels) are privately owned and managed, and about 15,300 acres are owned and managed by DFG. Management for waterfowl typically is targeted at providing quality habitat for dabbling ducks and geese, including northern pintail, mallard, American wigeon, green-winged teal, and other dabblers. In dry years, the Marsh supports more than one-quarter of the central California wintering waterfowl population. This makes the waterfowl habitat in the Marsh critical to the survival of the Pacific Flyway wintering birds, particularly during drought conditions.

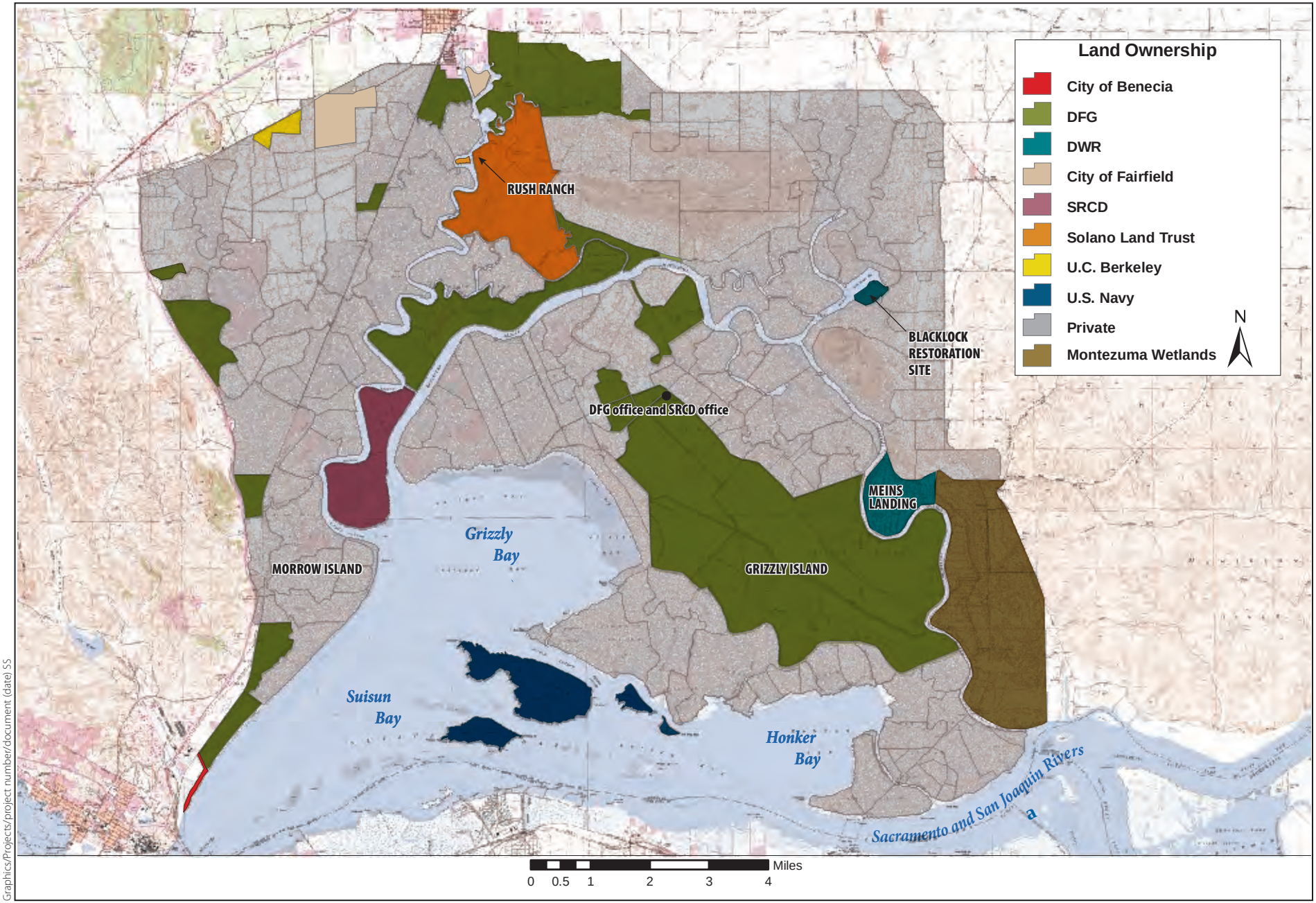

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Figure 1-4
Suisun Marsh Land Ownership

Other Habitats

Other habitat types are vernal pool, upland, tidal bays and sloughs, and riparian. In general, these habitats have been disturbed by the historical and current land management practices, including grazing; channelization and levee maintenance; managed wetland activities; and invasive species and have been affected by urbanization of the surrounding areas. Nonetheless, these historical and current land uses are consistent with applicable plans and policies and have prevented development of the Marsh.

Public and Private Land Use

As described above, there are currently 158 private duck clubs and more than 15,000 acres of public lands managed for duck hunting and other recreational activities. The full capacity to support non-consumptive recreational activities such as bird watching, walking, and wildlife viewing has not been achieved.

Levee System Integrity

The Marsh relies on levees to protect diked managed wetlands, roads, and other infrastructure from flooding. The following sections describe the current state of levees, levee maintenance funding, and the infrastructure they protect.

Levees and Levee Maintenance

As described above, there are approximately 200 miles of levees in Suisun Marsh maintained primarily by private landowners. Approximately 50 percent of these landowners have formed a Reclamation District (RD), a type of special-purpose district that is responsible for reclaiming and/or maintaining land threatened by permanent or temporary flooding, to address flood control. The State of California passed legislation (Water Code 5000 *et seq*.) allowing Reclamation Districts to form as a way to pay the costs associated with "reclaiming" the land.

In Suisun Marsh, RDs typically comprise a group of private landowners with the primary local responsibility for maintenance and repair of exterior levees, water control structures (pipes, fish screens, and pumps), water conveyance facilities, and access roads. These maintenance and repair activities are funded by the RD through the collection of fees or assessments of participating landowners. Today 13 RDs in Suisun Marsh perform activities in conformance with their original articles of incorporation and the Water Code (Figure 1-5). Landowners not members of an RD maintain their levees independently.

Approximately 10 percent (20 miles) of the 200-mile exterior levee system is included in some type of publically funded levee maintenance program, which

provides an extremely variable and limited funding source for levee maintenance. Currently, four miles of levee are within the legal boundary of the Delta and thus eligible to participate in the Delta Levee Maintenance Subventions Program. An additional 12 miles of levee from Van Sickle Island to Montezuma Slough are eligible to participate in the Special Projects portion of the Delta Levee Program. Therefore, more than 180 miles of exterior levees have no financial assistance for exterior levee maintenance. With such a small fraction of the Suisun Marsh levees in a DWR financing program, private landowners and DFG are solely responsible for levee maintenance and emergency repairs unless the state and federal governments intervene as they did following the flooding in 1998, and to a lesser extent in 2006. Additionally, maintenance of levees by private landowners and DFG is constrained by the difficulty in obtaining permits for dredging and importation of materials. Landowners maintaining levees in the Marsh have relied solely on limited materials from within diked managed wetlands or minimal dredging during the flood years (1998 and 2006) when emergency permits were granted. This lack of access to soils for levee maintenance makes it increasingly difficult for landowners to protect against catastrophic levee failure in the Marsh.

Diked Wetland Management and Resource Protection

Most of the levees protect the diked managed wetlands and allow for wetlands management and flood protection of clubhouses in the duck clubs. These levees make active wetland management possible by allowing control of diked wetland hydrology. Exterior levees in the Marsh protect managed wetlands. Managed wetland levee integrity is important to maintain habitats that support waterfowl and other wildlife species that depend on these areas and special-status terrestrial species that use them for at least a part of their life cycle. Failure of levees results in deep flooding of managed wetlands and typically results in the elimination or considerable reduction of suitable habitat for resident and migratory wildlife species. In most cases, levee failures are repaired to allow continued diked wetland management. A small number of properties have reverted to permanent tidal action resulting from unrepaired levee failures.

Infrastructure Protection

Many of the Marsh levees serve as important local transportation corridors and protect private and public infrastructure in addition to providing ecological and aesthetic value. Significant examples of public infrastructure, protected by locally funded levee maintenance programs, are the Union Pacific Railroad, Amtrak Capitol Corridor, the petroleum product pipeline to Travis Air Force Base, other petroleum pipelines, State Route (SR) 12, Solano County roads, natural gas production wells and transmission lines, electrical transmission lines, and more than $120 million invested by DWR and Reclamation in Suisun Marsh water conveyance facilities. Although very rural, the DFG Grizzly Island Wildlife Area Complex (comprising more than 15,000 acres of publicly owned

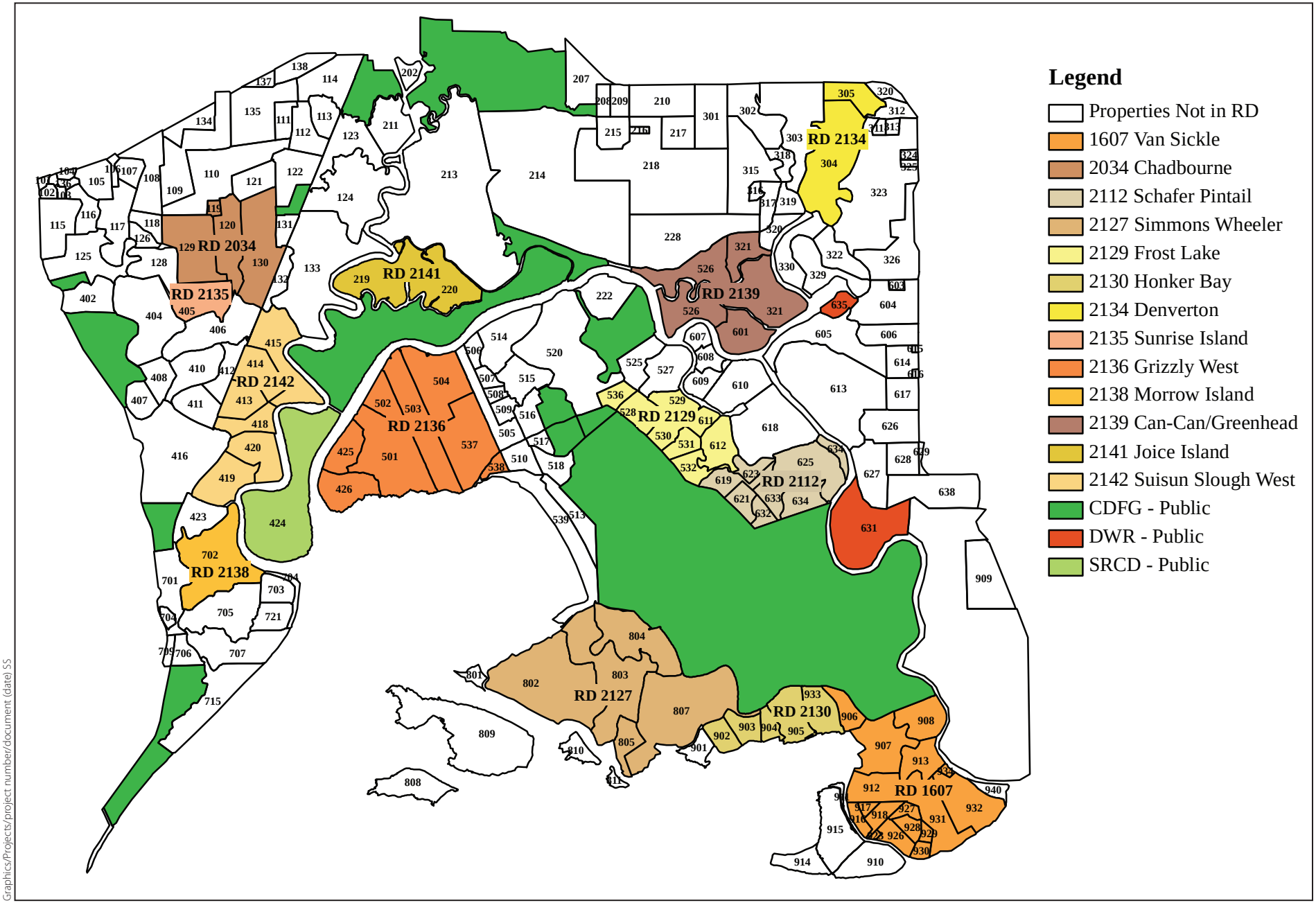

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Figure 1-5
Suisun Marsh Reclamation Districts

lands), includes local residents, families, homes, and private structures protected by this levee system.

Water Quality and Salinity Management

Salinity is the major water quality variable for Suisun Marsh because it affects the ability of managed wetlands to produce the vegetation and other habitat conditions necessary to support waterfowl. Salinity in the Marsh is controlled primarily by salinity in Suisun Bay. The applied salinity, as well as the drainage practices and leaching operations, controls the soil salinity, which in turn may limit or control the vegetation that is considered ideal for ducks and waterfowl in the managed seasonal wetlands (California Department of Water Resources 2000). Suisun Bay salinity is affected by CVP and SWP operations.

Salinity of water diverted for waterfowl habitat in the managed wetlands of the Marsh and Delta water management for agriculture, water supply diversions, and exports became linked in the 1978 State Water Resources Control Board Bay-Delta Water Quality Control Plan (WQCP) and D-1485 Suisun Marsh salinity standards (objectives). The State Water Board required a plan of protection for Marsh water quality conditions. Initial facilities (Figure 1-6), including improved RRDS facilities to supply approximately 5,000 acres on Simmons, Hammond, Van Sickle, Wheeler, and Grizzly Islands with lower salinity water from Montezuma Slough, and the Morrow Island Distribution System (MIDS) and Goodyear Slough outfall to improve water supply for the southwestern Marsh, were constructed in 1979 and 1980; the Plan of Protection for Suisun Marsh was approved in 1984. The SMSCG on Montezuma Slough near Collinsville began operating in October 1988. The gates control salinity by allowing tidal flow from the Sacramento River into Montezuma Slough during ebb (outgoing) tides but restricting the tidal flow from Montezuma Slough during flood (incoming) tides. The gates cause a net inflow (about 2,500 cubic feet per second [cfs]) of low-salinity Sacramento River water into Montezuma Slough. Operation of the SMSCG lowers salinity in some Marsh channels, primarily those in the eastern Marsh, and results in a net movement of water from east to west. The SMSCG generally are operated from October through May to meet the Suisun Marsh salinity standards (objectives). The salinity monitoring stations are shown in Figure 1-7. In addition to these facilities, the Cygnus and Lower Joice units, original SMPA facilities, were completed to allow more rapid filling and enable proper management of wetlands, thus contributing to salinity management.

Besides salinity for managed wetlands, drinking water, and agricultural water, other water quality issues include low dissolved oxygen (DO), elevated temperature, ammonia, suspended sediments (SS) and mercury, especially as they relate to fish and other aquatic species habitat conditions.

Relationship of the Suisun Management Plan to Other Regulations and Ongoing Plans and Studies

The Delta, including Suisun Marsh, is the focus of many ongoing plans and studies intended to manage the various Delta resources. The following sections describe some of these plans and studies and their relationship to the SMP.

Relationship to the CALFED Bay-Delta Program

CALFED was a cooperative effort of 25 state and federal agencies with regulatory and management responsibilities in the Bay-Delta to develop and implement a long-term comprehensive plan to restore ecological health and improve water management for beneficial uses of the Bay-Delta system. The collaborative planning process identified comprehensive approaches to the problems of ecosystem quality, water delivery reliability, water quality, and Delta levee integrity.

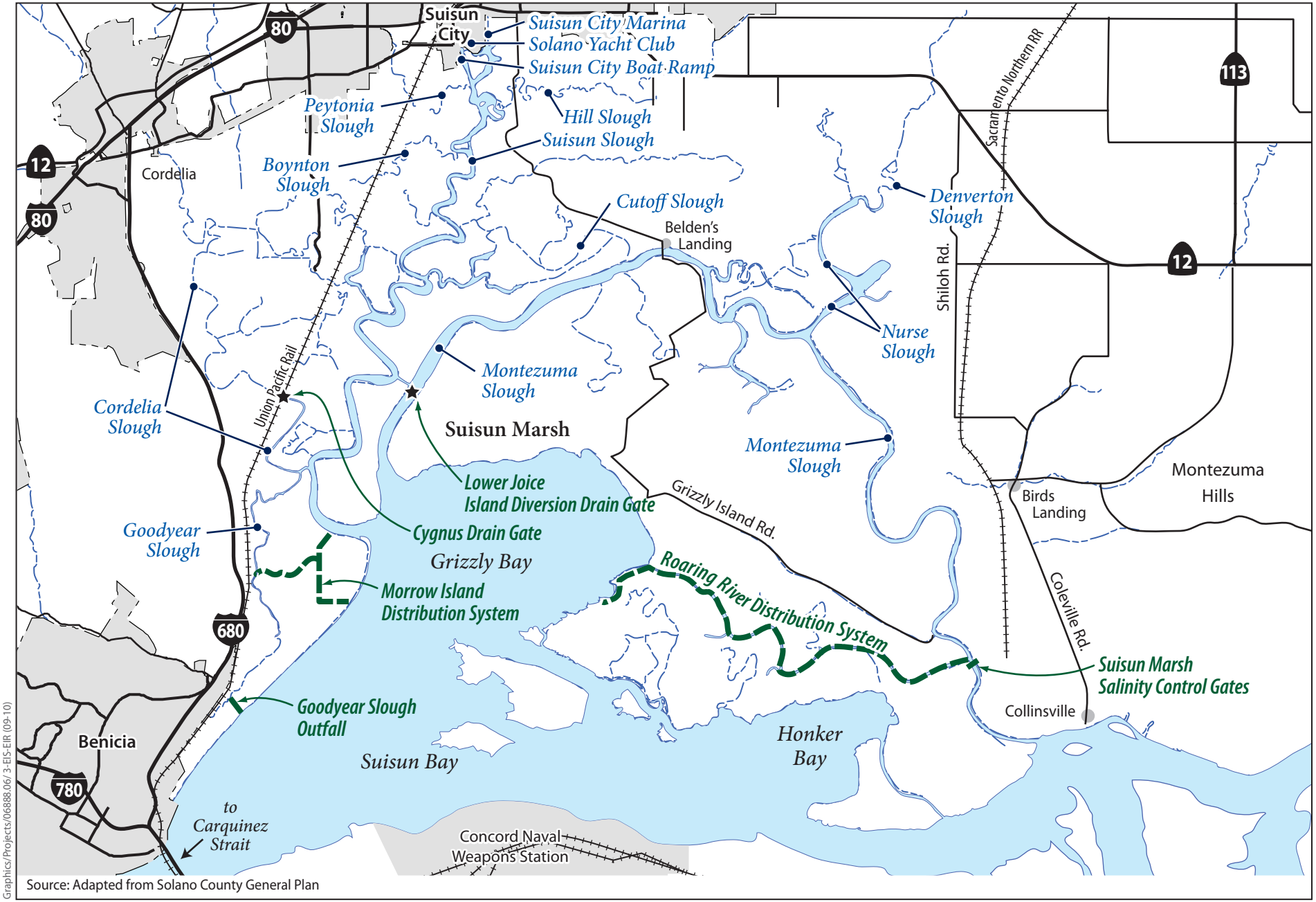
In July 2000, the CALFED agencies released the final Programmatic Environmental Impact Statement/Environmental Impact Report (PEIS/EIR) (CALFED Bay-Delta Program 2000b), which analyzed a range of alternatives to solve Bay-Delta system problems. In August 2000, the CALFED agencies adopted a preferred alternative that included measures to reduce potential conflict between stakeholders, restore Bay-Delta ecosystem functions, support levee integrity, and provide an adequate water supply for all beneficial uses of water (CALFED Bay-Delta Program 2000a).

The Preferred Program Alternative described in the CALFED ROD is a long-term plan that includes a variety of different potential actions to be implemented over the next 30 years by numerous public and private entities to improve the health of the Bay-Delta estuary. Suisun Marsh is addressed in the Levee System Integrity Program and the ERPP:

- Restore 5,000 to 7,000 acres of saline emergent wetland and assist in protecting and enhancing 40,000 to 50,000 acres of degraded seasonal wetlands. (CALFED Ecosystem Restoration Program Plan Volume II: Ecological Management Zone Visions [CALFED Bay-Delta Program 2000c: 149]).

Specific actions described in the CALFED ROD relative to Suisun Marsh include:

- Evaluate and, where appropriate, rehabilitate Suisun Marsh levees. (CALFED Bay-Delta Program 2000a: 20).
- Restore habitat in the Delta, San Pablo Bay, Suisun Bay, Suisun Marsh, and Yolo Bypass, including tidal wetlands and riparian habitat. In addition, 8,000 to 12,000 acres of wildlife-friendly agricultural lands will be established in cooperation with local participants (CALFED Bay-Delta Program 2000a: 39).



Source: Adapted from Solano County General Plan

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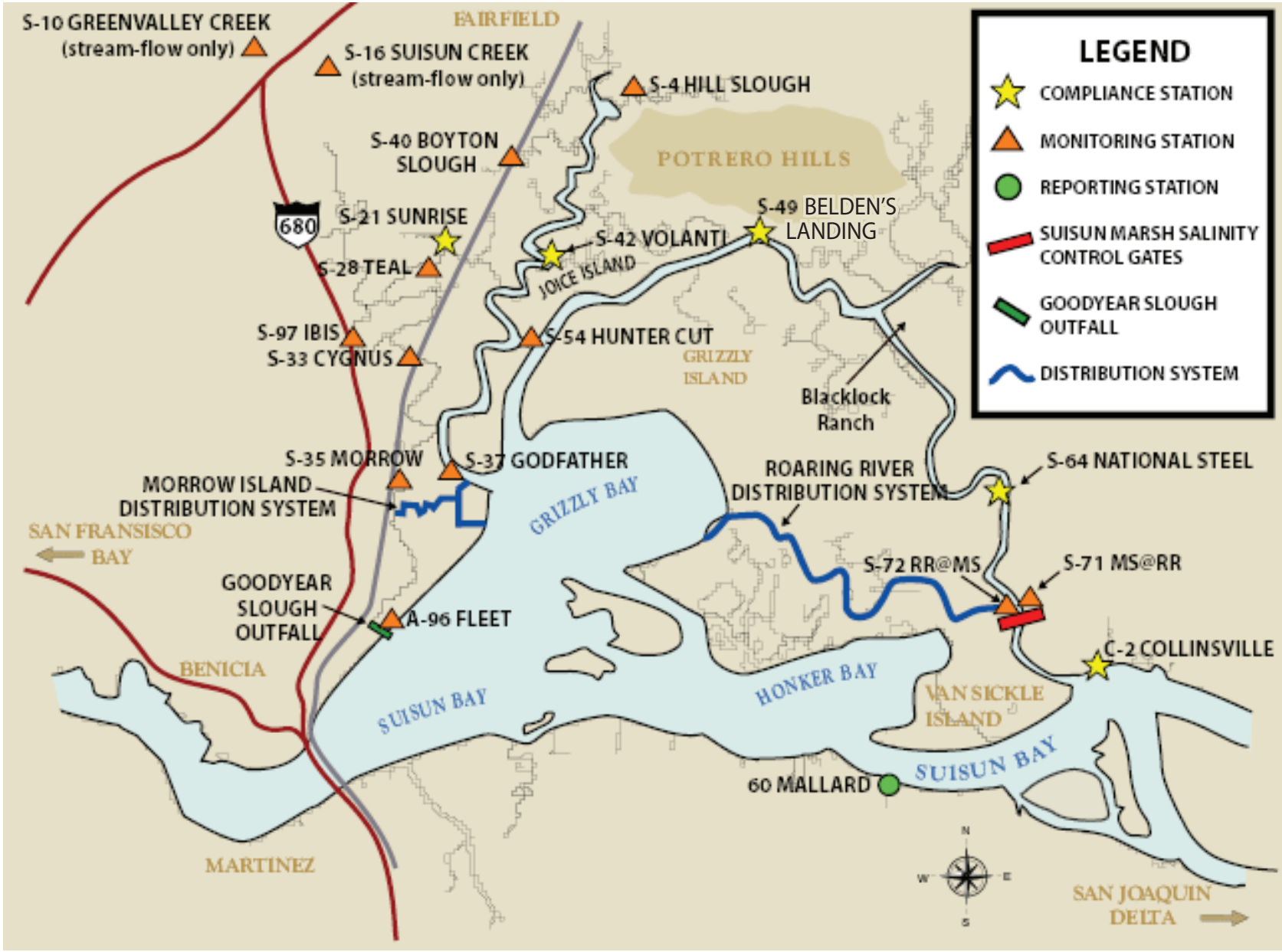
Figure 1-6
DWR and Reclamation Salinity Control Facilities In Suisun Marsh



Source: Department of Water Resources, Environmental Services Office, Suisun Marsh Program website.

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Figure 1-7
Map of Suisun Marsh Monitoring and Compliance Stations

The CALFED ROD also notes that actions implemented under the CALFED Program needed to be based on sound science and include science-based adaptive management (CALFED Bay-Delta Program 2000a: 37). The Principal Agencies created a Science Integration Strategy to assure that the SMP was developed using these principles. The Science Integration Strategy includes employing a Science Advisor to assist in the development of conceptual models for key ecosystem functions and habitats and a Scientific and Technical Advisory Panel (STAP) and other peer review methods to provide independent review of the technical basis of the SMP. Additionally, Conceptual Models for Marsh habitats and processes have been developed and will serve as living documents that will guide restoration activities as new information is developed and incorporated into the models. The models can be viewed at <http://www.dfg.ca.gov/delta/SuisunMarsh>.

The SMP also meets the policy commitments described in the CALFED ROD that each project implementing the CALFED Program would be subject to the appropriate type of environmental analysis and will evaluate and use the appropriate programmatic mitigation strategies described in the CALFED PEIS/EIR and the CALFED ROD. (CALFED Bay-Delta Program 2000a: 29–30, 32–35, and Appendix A.) This SMP EIS/EIR focuses on a more specific plan and geographic area. The SMP is intended to implement specific ERP goals of CALFED, including restoration in Suisun Marsh. As such, the CALFED PEIS/EIR was used to guide development of SMP alternatives. This EIS/EIR stands alone with an independently developed analysis of the impacts of the SMP, including direct, indirect, and cumulative impacts, and avoidance/mitigation measures.

In 2003, the California Bay-Delta Authority Act created the CBDA and also designated Implementing Agencies responsible for conducting actions necessary to implement various program elements of the CALFED Program. The ERP Implementing Agencies were DFG, USFWS, and NMFS. The ERP Implementing Agencies have a framework through which they implement the ERP. Management-level representatives of the agencies, called ERP Implementing Agency Managers (ERPIAMs), meet regularly to discuss ERP priorities in light of annual findings related to program milestones, develop annual program plans and proposal solicitation packages reflecting those priorities, select which grant proposals to fund, and consider amendments to ongoing ERP-funded projects. This existing framework will be used as ERP implementation continues in the Delta Ecological Management Zone (EMZ) and in the other ERP focus areas.

In November 2009, California legislation disbanded the CBDA as the governing body for CALFED. This role has been assumed by the new Council along with the additional charge to develop and implement a plan to address water supply and ecosystem issues in the Delta. The Council and the Delta Plan are described below.

Relationship to the Delta Regional Ecosystem Restoration Implementation Plan

The Delta Regional Ecosystem Restoration Implementation Plan (DRERIP) is one of four regional plans intended to guide the implementation of the CALFED ERP element. DRERIP concluded at the end of 2008 with completion of a broad suite of conceptual models and restoration action evaluation tools all founded within the adaptive management framework described in the CALFED ROD; it did not progress to the stage of developing an implementation plan. The DRERIP refined the planning foundation specific to the Delta with some applicability to Suisun Marsh. DRERIP developed a suite of conceptual models collating the latest science on ecosystems, processes, stressors, and species related to protecting and enhancing ecosystem function and protecting and recovering natural estuarine communities and native estuarine species. Some of these conceptual models used information developed for the Suisun Marsh conceptual models and are applicable to the Marsh. DRERIP also developed methods for using the conceptual models to conduct technical evaluations of proposed ecosystem enhancement and restoration actions and developed guidelines for how to write a restoration action in a manner well suited to effective technical evaluation. These tools are directly applicable to the SMP. The SMP and DRERIP are linked through some of the scientific conceptual models being developed for each. They would be linked hydrodynamically by tidal wetland restoration and they are linked ecologically through the movement of many fish and wildlife species.

Relationship to the Delta Vision Process

Delta Vision identified strategies for managing the Delta, including Suisun Bay and Marsh, as a sustainable ecosystem that would continue to support environmental and water supply reliability functions that are critical to the people of California. It evaluated the existing and proposed land and water uses, ecosystem functions and processes, and management practices in the Delta-Suisun region. (Delta Vision 2008.)

The Delta Vision Task Force has recommended natural values and functions, services, and management practices that should be considered priorities for future management as part of a sustainable Delta-Suisun region. Its October 2008 Strategic Plan identified and evaluated alternatives in the use of land and water resources, services to be provided in the Delta-Suisun region, governance, funding mechanisms, and ecosystem management practices. The ERP Stage 2 conservation strategy is recommended as the “single blueprint” for ecosystem restoration in the Delta EMZ under the new Delta Plan, which is the next step in the Delta Vision process, as described below.

This EIS/EIR has been developed in coordination with the recommendations of the Delta Vision Process. As a member of the Delta Vision Stakeholder Coordination Group, the SRCD has participated actively in the Delta Vision

Process and informed the Stakeholder Coordination Group, Blue Ribbon Task Force Committee, and staff of the SMP EIR/EIS development and Plan elements. Throughout this 2-year process, SRCD shared SMP goals and objectives and made several public presentations to the Coordination Group and Blue Ribbon Task Force Committee, with the support of other SMP Principal members.

Delta Stewardship Council and Delta Plan

In late 2009, a new Delta governance package was passed by the Legislature that establishes a Council, a Delta Conservancy, a Delta Science Program, and a "revamped" Delta Protection Commission. The precise relationship between the ERP and this new governance structure has yet to be determined. However, the ERP Implementing Agencies (ERPIA) intend to use the current project identification and selection process framework as ERP implementation continues in the Delta EMZ and in the other ERP focus areas. To the extent that ERPIAMs-identified priorities and funding recommendations involve actions in the Delta EMZ, it is expected that ERPIAs will annually present their annual work plan to the Council to demonstrate consistency with any future comprehensive Delta Plan and the preceding years activities. The Council then would determine whether it is consistent with the Delta Plan.

The Sacramento–San Joaquin Delta Reform Act of 2009 (Act) created the Council, disbanded the CBDA, and transferred CBDA's CALFED responsibilities to the Council. Additionally, the Council is charged with developing a Delta Plan. The Act also creates the Delta Conservancy, which is charged with implementing efforts that advance both environmental protection and the economic well-being of Delta residents. By 2012 the Conservancy board is to adopt a strategic plan that "shall be consistent with the Delta Plan,…the Suisun Marsh Preservation Act of 1977…, and the Habitat Management, Preservation and Restoration Plan for the Suisun Marsh."

Relationship to the Suisun Marsh Preservation Agreement

As described above, the SMPA is a contractual agreement among DFG, DWR, Reclamation, and SRCD intended to mitigate the salinity impacts in the Marsh related to SWP and CVP operations, and other upstream diversions. The SMPA was first signed in 1987 and since then has called for the development of many of the salinity control and monitoring facilities in the Marsh. In 2005, the SMPA was revised to replace the construction of additional large-scale salinity management facilities, as outlined in the 1984 Plan of Protection, with landowner-based management activities. As part of the revised SMPA, DWR and Reclamation would provide funding through the PAI Fund, which is an element of the SMP (described in detail in Chapter 2). Essentially, the PAI Fund is a mechanism that allows DWR and Reclamation to cost-share for certain

managed wetland activities that assist landowners in meeting the desired flood and drain cycles to accommodate higher salinities applied to the managed wetlands and maintain existing habitat conditions.

The salinity management facilities and ongoing maintenance by landowners in the Marsh, including those that could be funded with the PAI Fund under the SMP, have been subject to Clean Water Act (CWA) Section 404 permitting through the Corps, and associated federal ESA compliance and consultation. As part of this 1981 ESA consultation with USFWS, the SMPA agencies have mitigated impacts for the implementation of the Plan of Protection and potential salt marsh harvest mouse habitat through the establishment of conservation and restoration areas, including the Blacklock parcel. In a letter sent to the SMPA agencies in 2007, the USFWS acknowledged that the completion of the restoration at Blacklock satisfied the goal of the original conservation measures for ongoing impacts on the salt marsh harvest mouse and also provided benefits to other tidal marsh–dependent species. Therefore, with completion of the Blacklock restoration project the total of 2,500 acres of Conservation Areas achieved the goal of preferred salt marsh harvest mouse habitat and mitigated the current ongoing impacts related to the managed wetland activities, including those that would be continued under the SMP (U.S. Fish and Wildlife Service 2007).

Relationship to the Regional General Permit 3

As described above, the SMPA agencies have been subject to CWA Section 404 permit requirements. Currently, many of the ongoing maintenance activities implemented in the Marsh are permitted through Corps 404 Regional General Permit (RGP) 3. RGP 3 is used by DFG and other landowners (as represented by SRCD) to complete work necessary to maintain and operate managed wetlands. The SMP includes the continuation of these activities, plus an increase in frequency of these activities. Additionally, the SMP includes activities that occur in the Marsh but were not included in RGP 3 (such as those activities currently conducted by DWR and Reclamation) and some activities that are new to the Marsh. These specific activities are described in Chapter 2, Table 2-5.

Relationship to the Bay-Delta Conservation Plan

The Bay-Delta Conservation Plan (BDCP) is a conservation plan being prepared to meet the requirements of the ESA, CESA, and the State of California's Natural Communities Conservation Planning Act (NCCPA). DWR (and potentially state and federal water contractors) intends to apply for ESA and CESA incidental take permits (ITP) for water operations and management activities in the Delta. These incidental take authorizations would allow the incidental take of threatened and endangered species resulting from covered activities and conservation measures that will be identified through the planning process, including those associated with water operations of the SWP as operated by DWR, and certain

Mirant Delta LLC (Mirant Delta) power plants. Additionally, if feasible, the BDCP will be used as the basis for ESA compliance by Reclamation, including compliance with Section 7 of ESA in coordination with USFWS and NMFS for operation of the CVP. Ultimately, the BDCP is intended to secure authorizations that would allow projects that restore and protect water supplies, water quality, and ecosystem health to proceed within a stable regulatory framework.

Although the geographic scope is more specific to Suisun Marsh, the SMP shares the BDCP objective of protection and restoration of habitat that supports many species covered by the BDCP. The BDCP covered activities include SWP and CVP facility operations. However, potential BDCP conservation actions are not confined to the legal Delta and specifically include Suisun Marsh for potential restoration actions. In addition, the two plans cannot be implemented as mutually exclusive activities. Suisun Marsh is inextricably linked to the greater Delta in terms of hydrodynamics, habitat continuity and quantity, and water quality. Current and future actions in Suisun Marsh have the potential to affect BDCP objectives. The reverse is also true.

The BDCP team tentatively has identified Suisun Marsh as having "high opportunity/low constraints" for such restoration relative to most other areas throughout the Delta. Attributes that suggest high opportunity include the fact that a great deal of planning, regulatory compliance, monitoring, and stakeholder collaboration has been performed pursuant to the SMP and this EIS/EIR. Availability of public lands (plus a general willingness of private landowners to participate) and multiple salinity gradients that can support habitat diversity and critical ecological processes also were identified as favorable attributes of Suisun Marsh.

Restoration and enhancement of terrestrial and riparian natural communities, enhancement and adaptive management of aquatic habitats, and other BDCP conservation objectives potentially can be leveraged to implement actions that also benefit Suisun Marsh. For example, restoration specified in the SMP potentially could benefit from a source of implementation funding. Such cost-sharing could be mutually beneficial to the SMP and BDCP objectives. Potential also exists to implement restoration beyond the SMP (using BDCP resources) should actions of such magnitude be deemed warranted by and agreeable to BDCP participants.

Relationship to the Regional Water Quality Control Board Delta Strategic Plan

The Delta Strategic Plan (DSP) is a workplan to direct staff of the State Water Board, Central Valley Regional Water Quality Control Board (RWQCB), and San Francisco Bay RWQCB of the actions the Water Boards will complete to protect beneficial uses of water in the Bay-Delta and provides timelines and resource needs for implementing the actions. Workplan activities cover a range of actions that: (1) implement the State Water Boards' core water quality

responsibilities; (2) continue meeting prior State Water Board commitments; (3) are responsive to priorities identified by the Governor and the Delta Vision Blue Ribbon Task Force; and (4) build on existing processes, such as the BDCP. Overall, the workplan identifies a range of actions that constitute a reasonable sharing of responsibility to protect the Bay-Delta and the public trust, while still protecting diverse public interests.

One of the workplan elements is to review and implement Suisun Marsh objectives and take other appropriate actions. This effort will be coordinated with development of the SMP as a means of leveraging its water quality control planning functions and to ensure that linkages with other water quality control planning efforts, including BDCP, will be identified and considered. Water supply and beneficial use protection will need to be balanced in water quality control planning and implementation, and therefore in development of the SMP.

The goal is to take actions within the State Water Board's scope to appropriately manage, preserve, and restore habitat in Suisun Marsh to protect the public trust, fish and wildlife, and other beneficial uses of water in the Marsh and the Bay-Delta. The objectives of this project are to: support an interagency effort to develop the SMP; determine what, if any, changes may be needed to the Bay-Delta Plan Suisun Marsh water quality objectives and their implementation to protect the public trust and fish and wildlife beneficial uses; regulate, manage, and study pollutants in the Marsh; address development around the Marsh to minimize impacts on beneficial uses; and encourage development of a watershed management plan for the entire watershed in Solano County that is tributary to the Marsh.

This project will be coordinated closely with the SMP planning process, BDCP, Delta Vision, CALFED, and other processes as appropriate.

Relationship to the San Francisco Bay Long-Term Management Strategy

The San Francisco Bay Long-Term Management Strategy (LTMS) is a plan to maximize the efficiency of disposing of materials dredged from the San Francisco Bay region. Its goal is to ensure that dredging occurs in areas necessary to maintain navigation and that dredged sediments are applied to a beneficial use, such as levee maintenance or tidal marsh restoration. Sediment contaminant testing and water quality monitoring guidelines are included. Additionally, it was intended to streamline the permitting process for such activities. Suisun Marsh is in the San Francisco Bay LTMS region.

Relationship to the Delta Risk Management Strategy

The Delta Risk Management Strategy (DRMS) evaluated the sustainability of the Delta and Suisun Marsh and assessed major risks to the Delta and Marsh

resources from floods, seepage, subsidence, and earthquakes. The DRMS area included Suisun Marsh east of the Benicia-Martinez Bridge on Interstate 680 and the Delta (California Department of Water Resources 2008). DRMS also evaluated the consequences and developed recommendations to manage the risk. In addition, DRMS provided the majority of information needed to evaluate the potential impacts on water supplies derived from the Delta based on 50-, 100-, and 200-year projections for each of the following possible impacts: subsidence, earthquakes, floods, climate change, and sea level rise, or a combination of the above, as required under AB 1200 (California Water Code [CWC] Section 139.2 *et seq*.). The SMP EIS/EIR has considered elements of DRMS that pertain to the SMP.

San Francisco Bay Ecosystems Goals Project

The San Francisco Bay Ecosystem Goals Project (Goals Project) completed in 2000 was a 5-year collaborative effort sponsored by a group of agencies that included the U.S. Environmental Protection Agency (EPA), DFG, and the RWQCB, in addition to numerous other public and private entities. The Goals Project was developed as a way to implement the provisions of the San Francisco Estuary Project's 1993 Comprehensive Conservation and Management Plan (CCMP).

The purpose of the Goals Project was to provide guidance to public and private stakeholders interested in restoring and enhancing the wetlands and related habitats of the San Francisco Bay estuary system. It is an informational document that recommends the types, extent, and distribution of habitats needed to sustain diverse and healthy ecosystems in the San Francisco Bay estuary system. Recommendations are presented by region, subregion, and segment. Regionwide goals include restoration of large patches of tidal marsh connected by 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. The SMP area is located within the Goals Project's Suisun Marsh east and the Suisun Marsh west subregions. The Draft Report of the Subtidal Habitat Goals Project was released in June 2010 and the Final Report is due out in November 2010.

Goals Project recommendations specific to Suisun Marsh are listed below.

- An overall goal for this subregion is to restore tidal marsh on the northern and southern sides of Suisun Bay, Grizzly Bay, and Honker Bay and to restore and enhance managed marsh, riparian forest, grassland, and other habitats (Goals Project 1999: 94).
- A continuous band of restored tidal marsh, from the confluence of Montezuma Slough and the Sacramento/San Joaquin Rivers to the Marsh's western edge, should extend in an arc around the northern edge of the Marsh and should blend naturally with the adjacent grasslands to provide maximum diversity of the upland ecotone, especially for plant communities (Goals Project 1999: 94).

- A broad band of tidal marsh also should be restored along the southern edge of Suisun Marsh and around Honker Bay, in large part to improve fish habitat (Goals Project 1999: 94).
- On the majority of lands within Suisun Marsh, the longstanding practice of managing diked wetlands primarily for waterfowl should continue; these brackish marshes should be enhanced, through protective management practices, to increase their waterfowl carrying capacity (Goals Project 1999: 96).
- On the periphery of the Marsh, moist grasslands with vernal pools should be enhanced, as should riparian vegetation along the tributary streams (Goals Project 1999: 96).
- Between 17,000 and 22,000 acres of tidal marsh should be restored and 32,000 to 37,000 acres of diked, managed wetlands should be maintained (Goals Project 1999: 96).

Relationship to National Marine Fisheries Service and U.S. Fish and Wildlife Service Recovery Plans

NMFS and USFWS have written various recovery plans for threatened and endangered fish, birds, and mammals and for special habitat, such as vernal pool. The goals of all of the recovery plans are for habitat protection and increased numbers of special-status species so they can be delisted.

NMFS is responsible for anadromous fish and has written various recovery plans for threatened and endangered fish. NMFS has released a draft recovery plan (2009) for Chinook salmon (spring- and winter-run) and Central Valley steelhead. The plan states that successful recovery of these species includes increased abundance, increased population growth rate, increased population spatial structure, and greater genetic/life history diversity (National Marine Fisheries Service 2009). Two of the recovery plan goals are to:

- address threats to habitat quality and quantity; and
- provide sufficient habitat (type, amount, and quality) for long-term population maintenance.

A central California coast steelhead recovery plan and a green sturgeon recovery plan also are being written, but the publication dates are unknown.

USFWS has recovery plans for Delta fish species, salt marsh harvest mouse, California clapper rail, California least tern, tidal marshes, and vernal pools. These plans all call for recovery and delisting of special-status species.

The Recovery Plan for the Sacramento–San Joaquin Delta fishes (U.S. Fish and Wildlife Service 1996) covers all native fish species present in Suisun Marsh, such as delta smelt, green sturgeon, longfin smelt, Sacramento splittail, and all runs of Chinook salmon. The recovery objective is to delist delta smelt and

restore populations of other fish species. Actions required to increase numbers of fish include enhancing and restoring aquatic and wetland habitat in the Sacramento–San Joaquin River estuary. The Recovery Plan focuses on Suisun Bay and Suisun Marsh as habitat for delta smelt, longfin smelt, green sturgeon, and Sacramento splittail.

The recovery plan for salt marsh harvest mouse and California clapper rail (U.S. Fish and Wildlife Service 1984) is currently being updated. The Draft Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California, which will replace the existing recovery plan, emphasizes reestablishment of diverse wetland habitats within the Bay-Delta region, including the range of habitats that would have persisted under natural conditions (U.S. Fish and Wildlife Service 2010).

Part of the recovery plan includes protecting and enhancing existing marsh habitat, restoring former habitat to tidal wetlands, and conducting additional research on habitat requirements and population trends, which includes areas in Suisun Marsh—Joice Island North, Joice Island South, and Suisun Slough North. Another part of the recovery plan is to protect essential mouse and rail habitat in Suisun Marsh, including: identifying areas of essential mouse and rail habitat; securing and managing essential mouse and rail habitat; and developing and implementing management plans for salt marsh harvest mouse and California clapper rail habitat in Suisun Marsh.

The California least tern recovery plan also calls for complete recovery of the species so it can be taken off the endangered list. Actions for recovery include preserving and managing nesting areas of existing colonies, developing and implementing least tern management plans/programs in existing use areas, and preserving and managing nesting areas for currently insecure colonies. At the time the recovery plan was written, no colonies were found in Suisun Marsh, so the plan area is not identified in the recovery plan. However, surveys conducted in 2006 identified a nesting colony on a sandy dredge disposal island in Montezuma Wetlands (Marschalek 2007).

The vernal pool recovery plan promotes natural ecosystem processes and functions by protecting and conserving intact vernal pools and vernal pool complexes within the recovery planning area to maintain viable populations of listed species and species of concern and prevent additional threats from emerging over time. Contra Costa goldfields and alkali milk vetch have been identified in Suisun Marsh (U.S. Fish and Wildlife Service 2005). Detailed information regarding vernal pool habitat is discussed in Section 6.2, Vegetation and Wetlands.

Relationship to Central Valley Habitat Joint Venture 2006 Management Plan

The Central Valley Joint Venture (CVJV) is one of 17 Joint Venture partnerships in the United States, established under the North American Waterfowl Management Plan and funded under the annual Interior Appropriations Act. The CVJV brings together conservation organizations, public agencies, private landowners, and other partners interested in the conservation of bird habitat in California's Central Valley.

The Suisun Marsh is one of nine wetland basins addressed in the 2006 Central Valley Habitat Joint Ventures 2006 Implementation Plan. The plan included specific conservation measures to ensure adequate habitat characteristics and acreages to support the plan's goals for resident and wintering waterfowl, shorebirds, and other waterbirds in the Suisun Marsh. These measures include annual enhancement of 2,686 acres/year of existing seasonal wetlands. The SMP, through managed wetland activities, would contribute to this enhancement.

Scoping and Issues of Known Controversy

Scoping meetings were held November 25, 2003, at the Solano County Mosquito Abatement District in Fairfield, California; December 4, 2003, in the Dona Benicia room of the Benicia Public Library in Benicia, California; and December 10, 2003, in the Peña Adobe Room of the Solano County Office of Education in Fairfield, California.

NEPA requires that project proponents identify issues of known controversy that have been raised in the scoping process and throughout the development of the SMP. Reclamation, USFWS, DFG, and other Principal Agencies considered these concerns in the development of the SMP. All significant environmental impacts resulting from constructing and operating the SMP will be mitigated to a less-than-significant level. The following sections outline those issues that have been identified by agencies and the public relative to the SMP and each of these issues is addressed in this EIS/EIR.

Ecological Processes

Concerns have been raised about the potential goals of the SMP's proposed tidal marsh restoration and the potential economic costs of these restoration activities. Specifically, there are concerns about the potential final conditions of restored tidal marshes, the level of effort necessary to achieve these restored conditions, and whether the planning process ensures that ecological/habitat conditions are being improved. In addition, the public requested that the potential effects of sea level rise on each of the SMP's alternatives be addressed.

The economic costs of the SMP's alternatives, including the tidal marsh restoration component of these alternatives, are addressed in Section 7.3, Social and Economic Conditions, of this document. Effects of global warming, including a potential rise in sea levels, on the SMP's project components and goals are addressed in Section 5.9, Climate Change.

Property Acquisition

Concerns about property acquisition during implementation of the SMP have been expressed. As described in Chapter 2, the SMP will not include the acquisition of properties from unwilling sellers. Instead, implementing agencies would purchase land only from willing sellers whose land is considered appropriate for tidal restoration or other actions described in the plan. The SMP is a 30-year plan that is not intended to forcefully change the land use in the Marsh, but rather modify the dynamics of the marsh habitat over time.

Changes in Habitats and Land Uses

There is a concern about how changes in land uses would affect habitats in the Marsh. Issues include the regulation and maintenance of fish screens, salt marsh harvest mouse populations and restoration, and the tidal marsh habitat restoration efforts and subsequent effects, including those on adjacent landowners in the Marsh. Overall, the SMP is intended to balance the benefits of tidal wetland restoration with other habitat uses in the Marsh by evaluating alternatives that provide for a politically acceptable change in Marsh-wide land uses, such as salt marsh harvest mouse habitat, managed wetlands, public use, and upland habitat. The multiple uses of the Marsh are all being considered as an important part of the plan, as demonstrated by the four equal purposes/objectives. A key component of the SMP is the implementation of managed wetland activities. The implementing agencies are committed, as described throughout this EIS/EIR, to ensuring that as managed wetland is converted to tidal wetland, remaining managed wetlands are enhanced.

Maintenance of Managed Wetland Functions

Many landowners in the Marsh voiced concern that restoration actions could affect their ability to manage their clubs to maintain current levels of hunting opportunities. Landowner concerns include loss of waterfowl habitat, reducing wintering waterfowl numbers in the Marsh, redistribution of waterfowl occurrence, impacts of increased salinity from tidal restoration and a reduction in managed wetlands diversity, wetlands seed production, and the decreased life expectancy of managed wetlands infrastructure. As such, this could result in an increased cost of maintenance. Additionally, there are concerns about the potential impacts on adjacent managed wetlands from muted tide stage from tidal

restoration resulting in decreased managed wetland drainage capacity. Each of these potential impacts is addressed in this EIS/EIR.

Levee System Integrity

There are concerns about the levee system integrity in the Marsh, given the existing and potential restrictions on levee maintenance activities, funding shortages, and potential changes in levee uses (e.g., levee function changes from an interior levee to an exterior levee) as a result of the SMP. It was suggested that dredging is a critical activity for the maintenance of levees and overall habitat quality. Permitting delays affect the ability of property owners to implement necessary levee maintenance activities in a timely manner. Parties responsible for the costs associated with levee maintenance should be identified and supported through a levee management emergency fund. Riprap was suggested as an effective way to protect levees from the erosion resulting from boat traffic. A component of the SMP is to provide levee system integrity as integral to the continuation of managed wetlands and the success of created tidal wetlands.

Nonnative Species

The public recommended that the eradication of nonnative species, such as *Lepidium*, *Phragmites*, and feral pigs, should be addressed in the SMP EIS/EIR. Other concerns were related to the SMP's ability to prevent the establishment of new nonnative species and to reduce the impact of established nonnative species. Another concern was to protect existing special-status species from harmful chemicals and other methods of weed control to reduce nonnative vegetation abundance. Acceptable methods to control nonnative species should be discussed and should include the burning of invasive plant species. Monitoring should be implemented to ensure these actions are benefiting the Marsh as a whole.

Water and Sediment Quality

Property owners adjacent to the Marsh have expressed concerns about the existing water quality conditions in the Marsh and the water quality effects of the SMP. The poor water quality of some small dead-end sloughs is referred to as *black water* and is a serious concern that needs to be addressed. Air quality issues associated with the poor water quality in these sloughs were also a concern. Questions were raised on the potential water quality effects of tidal restoration, levee removal, and water supply activities, such as Delta export pumping or increased freshwater inputs to the Marsh. It is believed that tidal restoration, with an eventual increase in flows resulting from tidal action, will help address at least some of these water quality concerns.

Public Use and Waterfowl Hunting

Local development surrounding and upstream of the Marsh was a primary concern of Marsh property owners. Urban runoff from these developments is believed to result in the transport of pollutants, such as oil/grease, fertilizers, and sediments, to the Marsh. Specific developments that were of particular concern were the Potrero Hills landfill and the proposed Benicia Intermodal Transportation Station.

Subsequent potential effects of implementation of the SMP on existing landowners and public use and access in the Marsh were also concerns. Marsh property owners questioned whether they would be required to sell their lands against their will. Upland game hunting, recreational fishing, mitigation of impacts on hunting/fishing/waterfowl habitat, and public access to private lands under mandate were additional issues raised during scoping.

Long-Term Funding, Plan Implementation, and Regulatory Reliability and Efficiency

Conflicts, a lack of cooperation, and other delays by regulatory agencies involved in the Marsh are a concern for landowners in the Marsh. The role of each agency and number of agencies involved in the management of the Marsh and activities therein (as proposed in the SMP and historically) are not well known by Marsh landowners and should be explained in the EIS/EIR. It was suggested that the SMP define the circumstances under which regulatory gridlock would constitute a regulatory taking of private land. The implications of the SMP implementation and/or increased agency involvement on private landowners in the Marsh should be addressed. It also was recommended that certain existing regulatory restrictions concerning California clapper rail protection and dredging be reevaluated. In addition, it was requested that Solano County and the City of Fairfield be involved in the SMP implementation process.

Consensus among regulatory agencies and landowners and funding for landowners are seen as critical elements to effectively implementing the SMP. It was recommended that to support the many public benefits derived from the private and public lands of the Marsh, mandated actions must be affordable to landowners and should be funded by the public. The public recommended that the SMP not impose additional restrictions on landowners or lengthen the amount of time required for landowners to obtain a permit for levee repair activities. It was suggested that restrictions regarding pumping, flooding, and draining Marsh areas be reevaluated to consider the freshwater supply needs of landowners.

Organization of This Document

This EIS/EIR is organized in the following chapters:

- Chapter 1, "Introduction"—This chapter introduces the Principal Agencies, CEQA and NEPA lead agencies, describes the purpose of and need for the plan, and presents background information needed to understand the plan purpose and need.
- Chapter 2, "Habitat Management, Preservation, and Restoration Plan"—This chapter presents a description of the plan elements, a summary of the alternatives screening process, and plan alternatives evaluated in this EIS/EIR.
- Chapter 3, "Overview of Impact Analysis Approach"—This chapter describes the various methods used in this EIS/EIR to assess environmental impacts as a result of the alternatives.
- Chapter 4, "Summary Comparison of Environmental Consequences"—This chapter summarizes the environmental impacts arising from each alternative and presents a comprehensive view of their similarities and differences.
- Chapter 5, "Physical Environment"—This chapter describes the affected environments and impacts of each alternative on water supply, hydrology, and Delta water management; water quality; geology, seismicity, and soils; flood control and levee stability; sediment transport; groundwater resources; transportation and navigation; air quality; noise; and climate change.
- Chapter 6, "Biological Environment"—This chapter describes the affected environment and impacts on fisheries, vegetation and wetlands, and wildlife as a result of the proposed alternatives.
- Chapter 7, "Land and Water Use, Social Issues, and Economics"—This chapter describes the affected environments and impacts on land and water use; social issues and economics; utilities and public services; recreation resources; power production and energy; visual and aesthetic resources; cultural resources; public health and environmental hazards; environmental justice; and Indian Trust Assets as a result of each alternative.
- Chapter 8, "Compliance with Applicable Laws, Policies, Plans, and Regulatory Framework"—This chapter lists and describes the regulations and constraints affecting the proposed plan.
- Chapter 9, "Growth-Inducing Impacts"—This chapter describes the potential for the plan and its alternatives to promote growth in the Suisun Marsh region and throughout California.
- Chapter 10, "Cumulative Impacts"—This chapter discusses potential and existing projects that, together with the SMP, may compound the impact on similar resources.
- Chapter 11, "Public and Agency Involvement"—This chapter describes the participation of the public and state, federal, and local agencies in

determining the alternatives issues that needed to be addressed in this EIS/EIR.

- Chapter 12, "List of Preparers"—This chapter lists the contributors to this document, including those who wrote and reviewed sections and composed graphics.
- Chapter 13, "References"—This chapter contains references for the information cited in this EIS/EIR.
- Chapter 14, "Response to Comments"—This chapter contains the public comments received on the draft EIS/EIR and responses to those comments.

Chapter 2

Habitat Management, Preservation, and Restoration Plan

Introduction

The Suisun Marsh Principal Agencies have agreed to jointly prepare the SMP to protect and enhance Suisun Marsh and existing managed wetland values, tidal habitats, endangered species, water quality, and levee integrity in Suisun Marsh. Overall, the SMP is intended to meet the purposes/objectives of and need for the plan as described in Chapter 1 and is consistent with CALFED, SMPA, applicable species recovery plans, and other interagency goals. As described in Chapter 1, Reclamation, USFWS, and DFG have agreed to act jointly as the NEPA and CEQA lead agencies, and Principal Agencies and other agencies also may use this document to comply with CEQA and/or NEPA as they implement specific restoration and managed wetland activities in the Marsh. Additionally, the SMP may offer guidance to other programs such as the BDCP by providing a framework for restoration or other activities in the Marsh.

Several regulations, as described in Chapter 1, are in place to protect water quality, fish, terrestrial animals and plants, and other important resources. The SMP would not conflict with these regulations.

Overview of Plan Elements

The SMP is a comprehensive plan designed to address the various conflicts regarding use of Marsh resources, with the focus on achieving an acceptable multi-stakeholder approach to the restoration of tidal wetlands and the management of managed wetlands and their functions. The SMP addresses habitats and ecological process, public and private land use, levee system integrity, and water quality through restoration and managed wetland activities. The plan is intended to guide near-term and future actions related to restoration of tidal wetlands and managed wetland activities. Specific actions that would be implemented in the near term under the SMP include revising the SMPA to implement the PAI Fund and implementation of increased frequency of current and new managed wetland activities.

California Environmental Quality Act/ National Environmental Policy Act Requirements

CEQA and NEPA require consideration of a range of alternatives to a proposed project that would attain most of the basic project objectives, while avoiding or substantially lessening project impacts, and fulfill the project purpose and need. A range of reasonable alternatives is analyzed to sharply define the issues and provide a clear basis for choice among the options. The CEQA/NEPA analysis also must include an analysis of the no project or no action alternative.

CEQA requires that the lead agency consider alternatives that would avoid or reduce one or more of the significant impacts identified for the project in an EIR. The State CEQA Guidelines state that the range of alternatives required to be evaluated in an EIR is governed by the "rule of reason"; the EIR needs to describe and evaluate only those alternatives necessary to permit a reasonable choice and to foster informed decision-making and informed public participation (Section 15126.6[f]). Consideration of alternatives focuses on those that can either eliminate significant adverse environmental impacts or reduce them to less-than-significant levels; alternatives considered in this context may include those that are more costly and those that could impede to some degree the attainment of all the project objectives (Section 15126.6[b]). CEQA does not require the alternatives to be evaluated in the same level of detail as the proposed project.

CEQ regulations for implementing NEPA (40 CFR 1502.14) require all reasonable alternatives to be evaluated objectively in an EIS, so that each alternative is evaluated at an equal level of detail. Alternatives that cannot reasonably meet the purpose and need do not require detailed analysis. An EIS must briefly describe alternatives to the proposed action where unresolved resource conflicts exist. NEPA does not require alternatives to offer some environmental benefit over the proposed action; however, neither does it discourage consideration of alternatives with lesser effects. NEPA requires that alternatives be evaluated at a comparable level of detail (40 CFR 1502.14[b]).

Terminology Used in This Document

NEPA and CEQA are similar in that both laws require the preparation of an environmental study to evaluate the environmental effects of proposed governmental activities. However, there are several differences between the two regarding terminology, procedures, environmental document content, and substantive mandates to protect the environment. For this environmental evaluation, the more rigorous of the two laws was applied in cases in which NEPA and CEQA differ. Additional detail regarding these differences is provided in Chapter 3.

Many concepts are common to NEPA and CEQA; however, the laws sometimes use differing terminology for these common concepts. Table 2-1 below compares the terminology of NEPA and CEQA. For this EIS/EIR, the terms used will be defined as necessary throughout the document.

Table 2-1. NEPA/CEQA Terminology

NEPA Term	Correlating CEQA Term
Lead Agency	Lead Agency
Cooperating Agency	Responsible Agency
Environmental Impact Statement	Environmental Impact Report
Record of Decision	Findings
Preferred Alternative	Proposed Project
Project Purpose	Project Objectives
No Action Alternative	No Project Alternative
Affected Environment	Environmental Setting

Alternatives Development Process

The restoration and enhancement goals of the ERPP called for 5,000 to 7,000 acres of tidal restoration and protection, and enhancement of 44,000 to 46,000 acres of managed wetlands in the Marsh. The SMP alternatives development process was founded on the basic assumption that the SMP would assist in meeting this CALFED objective. The mechanisms to accomplish this objective were the subject of much of the alternatives development process. During the scoping process, the Principal Agencies developed general goals to help the public identify potential actions that could be included in the plan.

- **Goal 1: Ecological Processes**—Rehabilitate natural processes where feasible in Suisun Marsh to support more fully, with minimal human intervention, natural aquatic and associated terrestrial biotic communities and habitats, in ways that favor native species of those communities, with a particular interest in waterfowl and sensitive species.
- **Goal 2: Habitats**—Protect, restore, and enhance habitat types where feasible in Suisun Marsh for ecological and public values, such as supporting species and biotic communities, ecological processes, recreation, scientific research, and aesthetics.
- **Goal 3: Levee System Integrity**—Provide long-term protection for multiple Suisun Marsh resources by maintaining and improving the integrity of the Suisun Marsh levee system.

- **Goal 4: Nonnative Invasive Species**—Prevent the establishment of additional nonnative species and reduce the negative ecological and economic impact of established nonnative species in Suisun Marsh.
- **Goal 5: Water and Sediment Quality**—Improve and/or maintain water and sediment quality conditions to provide good water quality for all beneficial uses and fully support healthy and diverse aquatic ecosystems in Suisun Marsh and eliminate, to the extent possible, toxic impacts on aquatic organisms, wildlife, and people.
- **Goal 6: Public Use/Waterfowl Hunting**—Maintain the heritage of waterfowl hunting and increase the surrounding communities' awareness of the ecological values of Suisun Marsh.
- **Goal 7: Long-Term Funding, Plan Implementation, Regulatory Feasibility, and Efficiency**—Develop and implement a plan that: (1) addresses long-term funding; (2) creates an efficient and reliable regulatory climate; (3) promotes effective management practices; and (4) improves coordination of activities among agencies with interests in and/or adjacent to Suisun Marsh.

These goals then were refined into the following plan purposes/objectives, which together are consistent with restoration and enhancement goals of the ERPP relative to the Marsh:

- Habitats and Ecological Processes
- Public and Private Land Use
- Levee System Integrity
- Water Quality

These purposes/objectives are described in detail in Chapter 1.

Next, several documents were reviewed for potential design and implementation actions to include in the SMP. These documents included:

- Suisun Marsh Protection Plan (San Francisco Bay Conservation and Development Commission 1976)
- Baylands Ecosystem Habitat Goals Report (GOALS Report) (Goals Project 1999)
- CALFED ROD (CALFED Bay-Delta Program 2000a)
- CALFED ERP Documents (CALFED Bay-Delta Program 2000c)
- Implementation Strategy of the San Francisco Bay Joint Venture (San Francisco Bay Habitat Joint Venture 2008)
- Central Valley Joint Venture Plan (Central Valley Joint Venture 2006)
- Salt Marsh Harvest Mouse and California Clapper Rail Recovery Plan (U.S. Fish and Wildlife Service 1984)

- North American Waterfowl Management Plan (U.S. Fish and Wildlife Service 1986)
- Restoration Plan for the Anadromous Fish Restoration Program, January 2001 (U.S. Fish and Wildlife Service 2001)
- Restoration Plan for the Sacramento/San Joaquin Native Fishes, November 1996 (U.S. Fish and Wildlife Service 1996b)
- Suisun Ecological Workgroup Report (Suisun Ecological Workgroup 2001)
- Suisun Marsh Preservation Agreement and Revised Suisun Marsh Preservation Agreement (Suisun Marsh Preservation Agreement 1987, 2005)
- Solano County General Plan (Solano County 2008)
- Solano Multispecies Habitat Conservation Plan (HCP) (Solano County Water Agency 2009)
- Solano County Mosquito Prevention Criteria (Solano County Mosquito Abatement District 1978)
- Solano County Policies and Regulations Governing Suisun Marsh (Solano County 1982)
- Suisun Marsh Management Plans (Suisun Resource Conservation District 2009)
- Recovery Plan for Vernal Pool Ecosystems of California and Oregon (U.S. Fish and Wildlife Service 2005, 2008)
- Draft Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (U.S. Fish and Wildlife Service 2010)
- California Least Tern Breeding Survey, 2006 Season (Marschalek 2007).

Based on these documents, a restoration approach was developed that is analyzed in this EIS/EIR for the restoration element. This restoration element is described below and is intended to contribute to meeting each of the project purposes/objectives.

Several ranges of restoration acreage for the SMP were considered during the screening process, ranging from none up to 35,000 acres restored in the Marsh. Three alternatives of differing restoration ranges, including the Proposed Project/Preferred Alternative, have been carried forward for detailed evaluation in this EIS/EIR. The amount of restoration included in the Proposed Project/Preferred Alternative was based on the CALFED ERPP restoration target for the Suisun Marsh ecoregion, which identified a tidal wetland restoration goal of 5,000 to 7,000 acres and a managed wetland protection and enhancement goal of 44,000 to 46,000 acres. The acreage ranges of tidal restoration per region were based on the draft Tidal Marsh Recovery Plan (U.S. Fish and Wildlife Service 2010). Additional alternatives were developed and screened based on other plans and documents that address restoration in the Marsh. Although some of these other plans such as the GOALS Report recommend restoration of up to 35,000 acres, restoration of more than 9,000 acres was determined to result in the

inability of the plan to meet the water quality, land use, and some habitat purposes/objectives of the SMP. With more than 9,000 acres restored over the 30-year plan, it was determined based on modeling that salinity at the south Delta export facilities would be substantially affected, the plan would be unacceptable to landowners, and it would be more difficult to maintain duck populations necessary for heritage hunting in the Marsh and protect species, such as the millions of migratory birds that depend on the managed wetland habitats. Similarly, restoration of fewer than 2,000 acres was not expected to meet any of the plan objectives because without substantial restoration, improvements in tidal wetland habitats and water quality would not occur, and managed wetland operations may be difficult to permit. Therefore, three alternatives encompassing a range of 2,000 to 9,000 acres of restored tidal wetlands are evaluated in this EIS/EIR, including the Proposed Project/Preferred Alternative of 5,000 to 7,000 acres.

To develop the management activities component of the SMP, the Principals evaluated the current activities conducted in the Marsh, how they are conducted, their effectiveness, and what additional activities would be needed to meet the SMP objectives. It was determined that for the most part, the current suite of activities is sufficient to meet the SMP objectives, but that frequency of these activities would need to be increased to meet the purpose/objective for managed wetland enhancement. Additionally, SRCD identified the need for a comprehensive dredging program to provide source material for exterior levee maintenance on managed wetlands, as well as other activities that have been implemented in the Marsh but were not a component of the current management regime. Working with the Principal Agencies and other regulatory agencies, SRCD developed a preferred dredging program based on the Proposed Project restoration component that minimizes the effects of dredging on habitats and species. This dredging program, along with the increased frequency of current activities, was grouped with the proposed restoration alternative. As such, the alternatives evaluated in the SMP include both a restoration and a management activities component with varying degrees of restoration and dredging.

Each alternative also may contribute to the achievement of goals outside the scope of the SMP (e.g., GOALS Report, USFWS and NMFS Recovery Plans, BDCP), and the selection of any alternative does not preclude future tidal wetlands restoration projects beyond the acreage evaluated in the SMP. There are 52,112 acres available that could be affected by tidal wetland restoration and managed wetland activities. For each action alternative, as tidal wetland restoration increases, the acreage subject to managed wetland activities decreases, unless existing upland areas can be purchased from willing sellers and restored to wetlands. Similarly, if the alternative has less tidal restoration, opportunities for managed wetland activities increase. Additionally, Principal Agencies and other agencies may implement restoration and managed wetland activities beyond what is described in this SMP.

Identification of a Proposed Project/ Preferred Alternative

CEQA's directives are written with the premise that the lead agency is reacting to a proposal or request for a discretionary action and conducting an environmental review of a "proposed project" (see for example, State CEQA Guidelines Sections 15124(a), (b); 15126(a); 15126.2(a); and 15126.6). Therefore, compliance with CEQA, in preparing an EIR, typically relates to analysis of the proposed project and alternatives (based on the proposed project's objectives). NEPA directs that the lead agency's environmental analysis in an EIS evaluate all reasonable alternatives (see 40 CFR 1502.14). NEPA also is written with the premise that there can be a "proposed action" if there is a non-federal applicant (see 40 CFR 1502.14[b]) and requires that lead agencies identify the preferred alternative if one exists at the time of the Draft EIS.

Alternative A was indentified in the Draft EIS/EIR as the Proposed Project/Preferred Alternative, from here on referred to as the Proposed Project, because of its consistency with restoration and enhancement goals of the ERPP, its ability to contribute to recovery of listed species, and acceptability by landowners in the Marsh. Details of Alternative A: Proposed Project, and alternatives are provided below.

Review of Project Alternatives

As described above, three alternatives, including the Proposed Project, were carried forward for evaluation in this EIS/EIR in addition to the No Action Alternative. The following section describes the differences in the action alternatives. The actions needed to accomplish the restoration and enhancement acreage targets are the same for each of the alternatives and are described below. As such, the difference between the Proposed Project and alternatives is the number of acres restored and enhanced. Table 2-2 summarizes these differences.

Alternative A: Proposed Project

Alternative A: Proposed Project includes the following components relative to tidal wetland restoration and managed wetland activities:

- restoring 5,000 to 7,000 acres in the Marsh to fully functioning, self-sustaining tidal wetland and protecting and enhancing existing tidal wetland acreage; and
- enhancing the remaining 44,000 to 46,000 acres of managed wetlands levee stability and flood and drain capabilities.

Alternative B

Alternative B would restore less tidal wetland than Alternative A and includes the following actions:

- restoring 2,000 to 4,000 acres of marsh to fully functioning, self-sustaining tidal wetlands and protecting and enhancing existing tidal wetland acreage; and
- enhancing the remaining 46,000 to 48,000 acres of managed wetlands levee stability and flood and drain capabilities.

Alternative C

Alternative C would restore more tidal wetland than Alternative A and includes the following actions:

- restoring 7,000 to 9,000 acres of the Marsh to fully functioning, self-sustaining tidal wetlands and protecting and enhancing existing tidal wetlands acreage; and
- enhancing the remaining 42,000 to 44,000 acres of managed wetlands levee stability and flood and drain capabilities.

Table 2-2. Differences in Amount of Tidal Wetlands Restored and Remaining Acres Subject to Managed Wetland Activities among the Alternatives (in acres)

Alternative	Tidal Restoration Target (acres)	Managed Wetlands Subject to Managed Wetland Activities (acres)
No Action Alternative	700	52,112
Alternative A, Proposed Project	5,000–7,000	44,000–46,000
Alternative B	2,000–4,000	46,000–48,000
Alternative C	7,000–9,000	42,000–44,000

No Action Alternative

A no action alternative is required pursuant to NEPA, and a no project alternative is required for CEQA. For the SMP, it will be referred to as the No Action Alternative. The No Action Alternative is described relative to each of the project purposes/objectives. The No Action Alternative is what is assumed to be the conditions should the SMP not be implemented.

Habitats and Ecological Processes

Under the No Action Alternative, the amount of restoration in the Marsh likely would be limited. Although the CALFED ERPP calls for tidal wetland restoration in the Marsh and other current planning efforts include restoration in the Marsh, it is not certain that substantial additional restoration would occur under the No Action Alternative. Implementation of tidal marsh restoration may be accomplished through other programs, such as through CALFED Proposition 204 or BDCP, or through mitigation obligations. There is a wide range of potential outcomes in the Marsh and there are currently no adopted plans for restoration. The potential for other plans to be implemented is outside the scope of the No Action description and analysis (although these plans are evaluated as part of the cumulative analysis). As such, the amount of restoration assumed to occur in the Marsh absent the SMP reflects conditions without a comprehensive restoration plan and provides a point of comparison for the SMP decision-makers and the public. Proposition 204 has funded approximately $1 million to acquire properties in the western and northern Marsh, with exact properties determined by willing sellers. Approximately 250 to 500 acres could be purchased, with the ultimate goal of restoration (although funding is not included for restoration). Additionally, DFG owns Hill Slough West, which is approximately 200 acres and would be restored with or without the SMP. Therefore, it is assumed for purposes of this No Action evaluation, approximately 700 acres could be restored absent the SMP. Additionally, any levee breaches that occur in inaccessible areas may not be repaired, and passive restoration would occur in those areas. Additional restoration would be difficult to achieve because of the absence of a framework to protect existing managed wetlands.

Habitat types and values for sensitive species, including Multi-Species Conservation Strategy (MSCS) species, could change substantially if operations and maintenance of managed wetlands are limited as a result of permitting difficulties. This would result in substantially reduced flood and drain operations, waterfowl habitat, hunting opportunities, and activities to maintain levees, resulting in an increased risk of levee failure. If some landowners in the Marsh were able to secure individual permits, diversion restrictions would continue to be enforced, and programs to encourage landowners to manage properties to protect habitat values for listed species would continue to be implemented. Additionally, programs to control managed wetland vegetation would continue. Installation of new water diversions would continue to be minimized, and fish screens would continue to be installed on existing diversions where feasible. Existing programs to control nonnative species and protect sensitive wetlands from the adverse effects of grazing would continue to be implemented. The extent to which regulatory mechanisms would limit managed wetland operations and maintenance is speculative, but it is assumed that absent the SMP, there would be substantial changes in management of the Marsh.

Additionally, without the SMP, including the CEQA and NEPA compliance for managed wetland activities and the PAI Fund (described below under the Action Alternatives), the impacts on landowners as a result of CVP and SWP operations would be only partially mitigated and would result in delayed implementation of

actions to provide equivalent or better protection of Suisun Marsh resources and would likely require the reopening of negotiations among the SMPA agencies. Existing DWR/Reclamation mitigation facilities and salinity stations would be repaired and maintained, but at a much slower rate due to obtaining permits, completing project specific CEQA/NEPA review, and compliance with mitigation measures imposed as a result.

Given the difficulty in securing permits to dredge and with continued difficulties in importing materials for levee repair, combined with a lack of a reliable funding source for levee repairs, it is likely that the No Action Alternative would result in degradation of managed wetland habitat. This degradation would result from the continued use of materials taken from within managed wetland areas to maintain levees, which would reduce drainage efficiencies and increase subsidence. Additionally, absent the SMP or other levee programs in Suisun Marsh, it is possible that naturally breached levees would not be repaired, resulting in a loss of managed wetland habitat. This loss of managed wetlands would result in an increase in tidal wetland habitat and local, and potentially regional, changes in salinity that may adversely affect drinking water quality, depending on the extent and location of the loss. However, because of the subsided conditions of many of the managed wetland properties in the Marsh, natural breaching may result in a majority of shallow-water or subtidal habitat, with limited tidal wetland areas around the edges of the flooded area.

Public and Private Land Use

Under the No Action Alternative, public and private land use, especially hunting, could be negatively affected if mechanisms for levee maintenance and flood and drain operations for managed wetlands are not improved, as described above. Additionally, natural breaches may lead to increased navigable waters, which would increase the area available to the public for recreational use. However, there would be no changes in types of recreational activities available, and there would be no deliberate expansion of opportunities such as hunting, fishing, and bird watching available in the Marsh.

Levee System Integrity

Under the No Action Alternative, levee system integrity throughout the Marsh likely would decrease. Currently, there is no reliable mechanism or funding for obtaining and using materials to maintain levees. It is expected that the current dredging restriction in the Marsh would remain in place, and minimal, if any, dredging would occur because of the difficulty in obtaining permits for dredging in tidal sloughs. Other means for obtaining materials (pond-bottom scraping) may not be permitted absent the SMP. Riprap and alternative bank protection measures would continue to be implemented, if permitted. However, in the event of a levee failure, it is not certain that levees would be repaired. Sea level rise

and climate change–induced storm intensity and frequency would increase pressures on the levee system.

Water Quality

Under the No Action Alternative, water management for maintaining the channel salinity within the Marsh to meet existing WQCP salinity objectives would continue, including regulation of Delta outflow and operation of the SMSCG. Natural, uncontrolled levee breaches could occur and, if not repaired, could result in changes in salinity regimes in the Marsh, and potentially the Delta, depending on the extent and location of the breaches. Delayed maintenance of existing DWR/Reclamation facilities and salinity stations due to obtaining environmental clearance for such work could increase the risk of facilities functioning properly, resulting in inadequate water quality being provided to wetland habitats. Resource managers and regulators may need to adapt to the changes by implementing different management practices and regulatory actions (e.g., the State Water Board could modify water quality standards), although some uncontrolled breaches may result in unmanageable salinity changes.

Under the No Action Alternative, the annual discharge of seasonally high levels of biochemical oxygen demand (BOD) with reduced DO concentrations, and somewhat higher methylmercury in some channels and sloughs would improve because of restrictions on managed wetland operations resulting from permitting difficulty that could restrict flood and drain operations. Additionally, if natural levee breaches restore tidal action to managed wetlands, there could be a reduced extent of managed wetland areas contributing to the BOD/DO depletion problem, which also could result in improved water quality within tidal waterways in Suisun. Total methylmercury loadings to the environment also may decrease, to the extent that the restored tidal areas produce less methylmercury.

The effects of the No Action Alternative on fish, wildlife, recreational opportunities, levee stability, water quality, and other important resources are discussed later in this EIS/EIR in the analysis of specific resource areas.

Proposed Project and Alternatives

As described above, all action alternatives of the SMP, including the Proposed Project, include the same basic components, which provide a framework for how restoration and managed wetland activities would be implemented. The alternatives differ in the amount of acreage of restored tidal wetlands and remaining managed wetlands subject to managed wetland activities. These differences result in variations on how other SMP components such as levee integrity, water quality, and recreation are affected and managed. The components of the action alternatives are described below. Following this discussion of SMP components is a description of how the alternatives specifically differ. The analysis of action alternatives in this EIS/EIR focuses on

the potential environmental effects, including benefits, of implementing the following actions to meet each alternative range.

The Proposed Project, described below, includes the following elements:

- restoration of tidal wetlands;
- increased frequency of currently implemented activities in managed wetlands;
- new managed wetlands activities, including dredging, placement of new riprap, and installation of new fish screens;
- environmental commitments;
- implementation of the SMPA PAI Fund; and
- adaptive management.

Restoration of Tidal Wetlands

Restoration of tidal wetlands would help to achieve the restoration goals established for the Marsh by the CALFED ERPP, San Francisco Bay Area Wetlands Ecosystem Goals Project, and USFWS's Draft Tidal Recovery Plan for the Suisun Marsh Ecoregion. Restoration of tidal wetlands in the Marsh would contribute to the recovery of special-status wildlife species, including small mammals (salt marsh harvest mouse, Suisun shrew), birds (California clapper rail, California black rail, Suisun song sparrow, salt marsh common yellowthroat), fish (salmonids, Delta smelt, longfin smelt, Sacramento splittail, green sturgeon), and plants (soft bird's-beak, Suisun thistle, Delta tule pea). Tidal wetland restoration also will be designed to accommodate sea level rise more easily than managed wetlands because the gradual elevations within tidal wetlands will not require the same level of levee maintenance and will provide an area for sediment accretion.

Tidal wetlands are composed of vegetated marsh plains and intertidal and subtidal channels, all of which provide habitat to support the various life history stages of native fish and wildlife species. There are approximately 7,672 acres of tidal wetlands currently in Suisun Marsh. Vegetated tidal wetland plains provide habitat for native plant species such as soft bird's-beak and Suisun thistle and nesting and foraging habitat for bird species such as California clapper rail, California black rail, Suisun song sparrow, salt marsh common yellowthroat, and some waterfowl species. Tidal marsh plains also contribute terrestrial and benthic invertebrates to the aquatic food web. Smaller fish will use the marsh plain when it is flooded by the higher tides. Tidal marsh pannes, sometimes found within the marsh plains, provide habitat for invertebrates that, in turn, support aquatic and avian communities, and they provide roosting habitat for shorebirds and waterfowl. Channels can provide habitat for native fish species such as the delta smelt, longfin smelt, Sacramento splittail, green sturgeon, and outmigrating salmonids. Channels also support phytoplankton production; phytoplankton is a food source for aquatic species and supports benthic

invertebrate production, providing a food source for fish, bird, and marine mammal species. The mudflat edges of tidal wetlands, found within channels at low tide and along open water marsh edges, provide habitat for numerous invertebrates and foraging habitat for shorebirds at low tide. Wetlands also provide critical habitat components for species generally considered strictly terrestrial, such as passerine birds (song sparrows) and raptors (short-eared owls and harriers) that feed and/or breed in wetlands and spend some time in adjacent upland habitats. Tidal wetlands along the marsh perimeter allow ecological connectivity to adjacent habitats, thereby supporting a broader range of wildlife species.

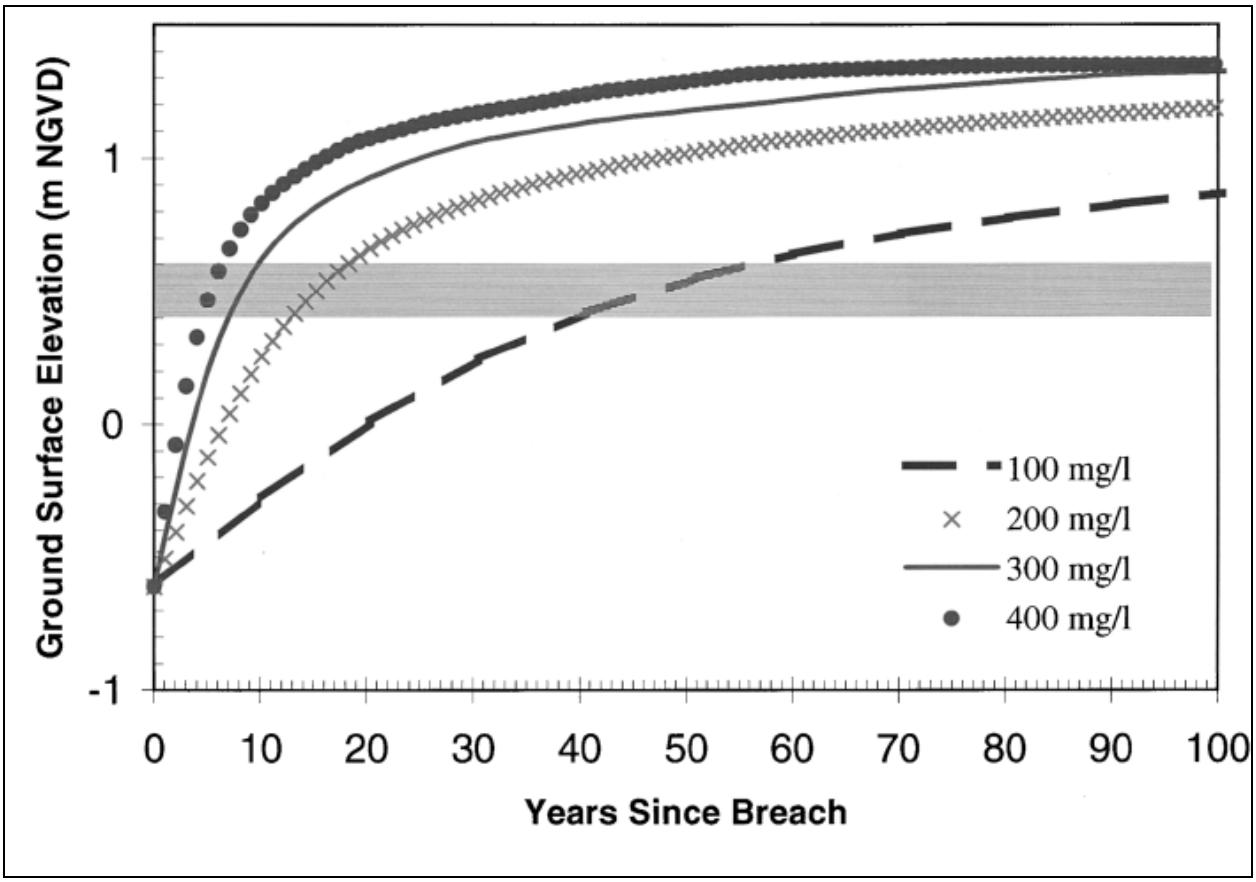
The strong salinity gradients in Suisun, both east-west along the main axis of the estuary and north-south from the main Suisun Bay channel to the upper reaches of the tides, provide widely differing tidal marsh conditions. Fresher wetlands will occur in the southeast of Suisun Marsh, with greater abundance of the taller tules and bulrushes. Marshes along the west side of Suisun would be far more saline, exhibiting far fewer tules and bulrushes and greater amounts of shorter salt-tolerant wetland plants. Between these two end points will be a broad variety of brackish marsh, with the plant communities reflecting the localized salinity regime.

The geographic position of tidal marshes within Suisun exerts additional factors in defining their ecological functions. Proximity to the main Suisun Bay channel connecting the Delta to San Francisco Bay affects population abundances of numerous aquatic species. Proximity to this main channel and also to the large shallow embayments in southern Suisun also provides a significant sediment supply for marsh accretion; areas removed from these sediment sources would take far longer for natural accretion. Proximity to the edge of Suisun links sites to adjacent uplands and in some locations to local streams, each of which has a large effect on species that could use a restored marsh; sites around the edge of Suisun may have the potential for sea level rise resiliency, if they are able to flood adjacent uplands over time and allow marsh landward expansion. In summary, location within Suisun Marsh is a critical factor in directing the ecological functions that a particular restoration site could provide.

Strategically restoring tidal wetlands gradually would provide a range of the above habitat values depending on the initial site conditions (mainly elevation), the local and regional physical evolution drivers, and location in Suisun. The ecosystem functions a restored site provides will change over time, with benefits to particular species increasing or decreasing with site evolution. Initially subsided sites may provide primarily subtidal aquatic habitat until the surface has accreted enough sediment for vegetation colonization; that process could take many years to decades (Figure 2-1) in the more subsided areas that are away from adequate sediment supply, and some locations could remain as open water indefinitely. Subtidal aquatic habitats provide many benefits to numerous species. Diving and dabbling ducks would have significant foraging habitat, the extent of which varies with the tidal cycle and thus water depth. Submerged and floating aquatic vegetation would provide significant food resources for birds and fish. Phytoplankton and zooplankton production in the water column would

support the food web. These areas may provide spawning substrate for some resident fish species.

Figure 2-1. Approximate Timelines of Accretion as a Function of Sediment Supply



Source: Williams and Orr 2002.

Note: This plot is for the lower, saline region of the San Francisco Estuary. Applies to sites sheltered from wind-wave action. The shaded bar identifies the approximate Spartina colonization elevation. Prediction is based on tides at the San Francisco Presidio, no sea level rise, and 550 kg/m^3 dry density of inorganics typical for San Francisco Bay. Spartina is not found within the marsh; therefore, this is used as an example to depict the relationship between breaching of levees and colonization elevation.

Restoration of tidal wetlands would be implemented over the 30-year SMP timeframe, and benefits from individual projects would change as elevations rise, vegetation becomes established, and vegetation communities shift over time from low marsh to high marsh conditions. All restored areas are most likely to provide different types and magnitude of benefits at any given period after restoration and at different geographic locations, as local and regional conditions will determine the salinity regime, plant communities, and rate of sedimentation. Existing elevation data (LIDAR) can be used to screen potential properties considered for acquisition and restoration, followed by a more detailed topographic survey. Also, the Charter acquisition considerations (Table 2-3) will be used to screen potential sites. In the interim, a range of subtidal habitat–ecosystem functions will be provided.

The specific actions that would be implemented as part of the tidal restoration component of the SMP are listed below.

Selecting Restoration Sites

Lands suitable for restoration of tidal wetlands would be acquired only from willing sellers. As opportunities present themselves, several factors would be considered for each site, as shown in Table 2-3. One overarching goal of restoration is to create a diverse mosaic of interconnected habitat types.

Table 2-3. Tidal Wetland Restoration Land Acquisition Considerations

Site Characteristic	Considerations
Species and Habitats	• Historical geographic ranges and current populations of species • Abundance of nonnative invasive species • Ability to support multiple habitat types following restoration • Inclusion in any recovery plans • Presence of listed species • Connectivity to adjacent existing tidal wetlands • Absence of existing or proposed industrial facilities in vicinity • Presence of upland transition
Waterfowl	• Existing suitability for supporting waterfowl populations • Suitability for supporting waterfowl populations when restored
Recreation	• Potential for recreationally important wildlife distributions and habitat use in surrounding areas • Potential for, and extent of, public access • Potential for disturbance to private property
Site Elevation	• Amount of imported fill material and grading required • Degree of subsidence and the ability to reverse subsidence through natural sedimentation and vegetation colonization/expansion (peat accumulation and sediment trapping) to promote functional, self-sustaining tidal wetlands plain elevations with natural upland transitions
Water Quality	• Potential for brackish water intrusion into the Delta • Potential for black water (low dissolved oxygen) conditions • Potential for adverse or beneficial effects on Delta, Suisun, and local salinity
Levees	• Currents, winds, adjacent properties, extant channel networks, topography, etc., in selecting the location and size of levee breaches • The extent to which the land requires flood protection levees to protect adjacent landowners • Potential flood liability when tidal action is restored

Site Characteristic	Considerations
Estimated Costs	• Costs of acquisition and restoration • Interim management costs • Long-term operations and maintenance (O&M) needs • Cost of upgrading interior levees to exterior levees • Cost of maintaining and/or rehabilitating exterior levees • Costs of maintaining levee access for construction/maintenance
Landscape Position	• Potential for site to accommodate sea level rise • Adjacent land uses • Presence of infrastructure such as transmission lines, rail lines, roads, etc. • Position relative to other planned or implemented restoration sites
Cultural Resource Potential	• Presence or absence of known cultural resources • Location of potential restoration areas with respect to areas sensitive for the presence of buried and surface-manifested cultural resources

The total amount of existing managed wetlands and uplands that could be affected by tidal restoration and managed wetland activities is 52,112 acres. As described above, based on hydrology and facilities, the Marsh has been divided into four regions for purposes of this analysis. The tidal wetland restoration acreages for each alternative are divided by region to achieve the total CALFED goal as described above and contribute to the USFWS tidal wetlands restoration goals. The USFWS *Draft Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California*[1] was used as a template in determining the goal of the percentage of restoration acreage per region (U.S. Fish and Wildlife Service 2010). Table 2-4 shows the goals of how much of each region would be restored under each alternative. The SMP includes the continued implementation of and increased frequency of some managed wetland activities and the implementation of new managed wetland activities on the balance of 52,112 acres that is not restored. Restoration sites would be selected based on their ability to contribute to the restoration goals for each region shown in Table 2-4 as well as the considerations described in Table 2-3.

[1] <http://www.fws.gov/sacramento/ea/news_releases/2010_News_Releases/tidal_marsh_recovery.htm>.

Table 2-4. Total Acres per Region and Percentage That Will Be Restored under Each Alternative

Alternative/Region	SMP Target for Tidal Wetland Restoration*	Percentage of Existing Managed Wetlands That Will Be Restored to Tidal Wetland under the SMP
Alternative A, Proposed Project	**5,000–7,000**	
Region 1	1,000–1,500	8.4%–12.6%
Region 2	920–1,380	12.6%–18.9%
Region 3	360–540	12.1%–18.1%
Region 4	1,720–2,580	6.0%–9.0%
Alternative B	**2,000–4,000**	
Region 1	500–1,000	4.2%–8.4%
Region 2	460–920	6.3%–12.6%
Region 3	180–360	6.0%–12.1%
Region 4	860–1,720	3.0%–6.0%
Alternative C	**7,000–9,000**	
Region 1	1,500–2,250	12.6%–18.9%
Region 2	1,380–2,070	18.9%–28.5%
Region 3	540–810	18.1%–27.3%
Region 4	2,580–3,870	9.0%–13.5%

USFWS = U.S. Fish and Wildlife Service.

SMP = Suisun Marsh Habitat Management, Preservation, and Restoration Plan.

* The targets were developed for each region based on the different habitat conditions within each region to provide the range of environmental gradients necessary to contribute to the recovery of listed species. These targets complement and are consistent with the Draft Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California. The Adaptive Management Plan will track these targets to ensure restoration benefits for listed species.

Note: Adjustments to the Adaptive Management Plan may result in changes to the targets in each region.

Site Preparation

Once a site has been acquired from a willing seller, the project proponent would undertake several land management activities necessary to prepare the site for restoration. These land management activities would need to occur from the time of acquisition until the time of restoration, which could last anywhere from 1 to 5 or more years.

Each restoration site would be designed to accomplish specific environmental goals by restoring historical conditions. To accomplish this, sites would need to be graded and prepared to re-create flows and hydraulic conditions. As such, ditches previously used for managed wetland flood and drain practices may be filled in with dirt, brush boxes, or other material. Depending on the timing of this activity, material removed from levees, either as breaches or grade-downs, or

from grading the restoration site could be used to fill adjacent ditches. In addition to or in lieu of filling in ditches, specific restoration designs may include placement of hay bales, brush boxes, or other slow-degrading material adjacent to levee breaches that block water access to ditches and direct tidal energy into the restoration area. Additionally, restoration preparation may include digging starter channels to increase tidal water connectivity.

Moist soil management likely would be implemented during the growing season to promote the natural production of desired wetland plant species. Depending on site elevations and local salinity regime, these pre-breach managed plant communities may persist following restoration of tidal action, or they may be sacrificial. Establishment of vegetation communities prior to inundation is expected to contribute suitable habitat immediately for some species, to discourage establishment of nonnative species upon inundation, to provide for early subsidence reversal, and to help capture suspended sediment once the site is restored to tidal action. Establishment of these vegetation communities is likely to increase the rate at which the tidal wetland matures, and could occur on the levees or in other areas of the restoration site.

Maintenance of levees and water control structures also may be required during the period prior to restoration of tidal action. Maintenance activities would follow the methods and approaches employed for the diked, managed wetlands. The extent of maintenance required would depend upon conditions at the time of acquisition and changes in those conditions that occur over time. However, structures peculiar to managed wetlands, including duck blinds and derelict pipelines, likely would be removed. Support apparatus for water control structures often require levee excavation and pile, culvert, flashboard riser, and gate removal. The removal of water control structures would depend on the moist soil management regime prior to breaching, but their eventual removal is expected at all sites.

Selecting Breach Location(s) at Restoration Site

Restoration would be accomplished by breaching and/or lowering existing exterior levees to restore tidal inundation. Depending on site-specific goals, levee modifications would be made in various ways by manipulating the opening width, depth, and/or slope angle. Breach edges may require scour protection with rock, geotextiles, or piles. Alternatively, long reaches of levee may be graded down to lower elevations—most likely between mean sea level and mean higher-high water (MHHW). Material would be used to create topographic variability and encourage diverse plant communities and shallow tidal habitat. Breach location, number, and size would be chosen based on two considerations. The first consideration is to maximize the ecological benefits of the restoration. Considerations would include ability to reconnect existing tidal channel networks from the site's history as a tidal marsh if those channels remain, providing suitable connectivity to the tidal source waterways, orientation relative to winds and currents to promote natural sedimentation and access to aquatic organisms, and constructability. The second consideration is to minimize upstream tidal

muting, tidal elevation changes, slough channel scour, and hydraulic changes, and restoration projects would be designed to ensure that changes in tidal flows remain below about 1 foot per second (fps). In general breaches on larger channels or multiple breaches would reduce the effects of the increased tidal flows on tidal elevations and velocities. If feasible based on site-specific conditions, breach locations would be located in areas that have minimal or no existing tidal wetlands on channel berms or in locations where the tidal wetland habitat value is lowest (e.g., riprap levee sections).

As part of each site-specific restoration action, project proponents will use an accurate tidal hydraulics and salinity model (e.g., the RMA Bay-Delta model or other appropriate model) to simulate the proposed action to ensure the impacts on scour, sedimentation, salinity, and other hydraulic processes do not exceed those described in this EIS/EIR. This information will be used to adjust designs of restoration projects and other activities to minimize adverse impacts on tidal elevations and velocities, or other site-specific characteristics, in the restoration site and/or in Marsh channels adjacent to restoration projects; minimize salinity effects at upstream Delta locations; and potentially create benefits related to scour and sedimentation.

Upgrading or Constructing New Exterior Levees

To protect adjacent properties from an increased risk of flooding, existing interior levees may be upgraded or new exterior levees would be constructed prior to breaching the levee. These new or upgraded levees would include brush boxes or other biotechnical wave dissipaters to protect the levee from wind and wave erosion.

Habitat levees that include benches or berms also may be constructed, which would provide similar wind and wave-action protection and opportunities for high marsh/upland transition habitat. The construction of habitat levees would depend on cost and availability of fill. Habitat levees are low, wide, gently sloping vegetated levees, which may be overtopped during storm surges with nominal eroding or destabilizing. Habitat levees are designed to allow intermittent flooding; minimize dispersal and denning of terrestrial predators; reestablish facsimiles of marsh topographic gradients; accommodate natural patterns of debris deposition and shoreline disturbance; and provide wave energy buffers (Interagency Ecological Program 2007).

Habitat levees may be planted and seeded with native marsh species and/or allowed to colonize naturally with native and naturalized species. This habitat would promote intertidal zones and mudflats that support various species that rely on a gradually transitioning marsh plain. Habitat levee design and locations would vary by site but are expected to include the widening of existing interior levees by 15 to 30 feet with a gradual slope or the construction of new interior levees or islands. Specifically, these benches or berms would be designed to create mid- and high-marsh habitat for dependent species and will be guided at least partially by information obtained through the adaptive management process.

It is expected that benches or berms that support habitat for these species would benefit many other species.

Habitat levees would be constructed from resources available at the time of construction and may include channel dredged material collected in bays and sloughs in the plan area, dredged material from outside the plan area, or material excavated within the tidal restoration area or other areas of the Marsh.

Increased and New Managed Wetland Activities

The managed wetlands of Suisun Marsh are managed specifically for duck hunting activities but also provide important habitat for a variety of resident and migratory waterfowl and shorebirds and other native and special-status species, and protection of these areas is a goal of many agencies and programs, including the Central Valley Joint Venture program and CALFED. These wetlands, which are managed for a diversity of wetland vegetation and other wetland wildlife food plants, are important as feeding and roosting areas for species such as geese, mallards, pintails, wigeons, and gadwalls. Managed wetlands also provide breeding habitat for shorebirds, which nest in a wide range of habitats from unvegetated wetland flats to uplands. Spring drawdowns practiced by Suisun Marsh wetland managers in conjunction with adjacent uplands provide foraging opportunities for migrating shorebirds.

Managed wetlands provide valuable habitat for a variety of non-waterfowl birds, mammals, reptiles, and amphibians. Birds such as Suisun song sparrow, salt marsh common yellowthroat, shorebirds, and ring-necked pheasant forage and nest in the managed wetlands. Managed wetlands support mammals such as salt marsh harvest mouse, northern river otter, coyote, raccoon, striped skunk, black-tailed jackrabbit, common muskrat, and tule elk, as well as native reptiles and amphibians (e.g., western pond turtle, gopher snake).

Managed wetlands face challenges and constraints such as aging water management facilities, threatened and endangered species regulations, subsidence, mosquito abatement regulations, and water quality issues, including salinity. Additionally, the aging levee system, which is difficult to maintain because of a lack of appropriate levee source materials and regulatory constraints, compromises the managed wetland system.

The intended outcomes of the managed wetlands activities described below are to maintain and improve habitat conditions and minimize or avoid adverse effects of wetland operations. For managed wetlands, the optimum flood and drain cycle is 30 days. The activities described below provide a suite of tools that can be used to maintain and improve levee stability and the 30-day flood and drain cycle. As described above and in Chapter 1, the restoration and enhancement goals of the ERPP include protecting and enhancing 40,000 to 50,000 acres of managed wetlands. The SMP assumes that managed wetlands are enhanced by improving levees and the flood and drain cycle because it allows managed wetlands to be managed as effectively as possible.

The ability for managed wetlands to improve habitat is also dependent on the availability of lower salinity water. DWR/Reclamation facilities and salinity stations are used to reduce water salinity and to distribute less saline water to managed wetlands. These facilities and stations must be maintained in order to work as intended.

Most of the managed wetland activities described below are already occurring in the Marsh. Some of the current activities would be modified, and new activities would be conducted. Many of the current activities would qualify for the SMPA PAI Fund, which is described below. Under the SMP, many of these activities would increase in frequency, primarily because of an increase in funding provided by the PAI Fund.

Increased Frequency of Currently Implemented Managed Wetland Activities

DFG, DWR, and landowners (as represented by SRCD) currently maintain their facilities and/or properties in the Marsh by implementing the actions listed below. Additionally, Reclamation contributes funding to DWR to implement operations and maintenance of facilities that mitigate the effects of the CVP/SWP, including RRDS, MIDS, Goodyear Slough Outfall, salinity stations, and other facilities and/or properties. The list below is a comprehensive description of most of the activities conducted by these agencies and landowners in the Marsh, although the activities each implements depend on their individual facilities, properties, and other factors. Some of these actions are expected to increase in frequency under the SMP because of the increase in effort to support the managed wetland targets as well as the PAI Fund (described below), and to ensure continuing functionality of state/federal facilities. The current level of activity combined with the increased frequency of currently implemented activities and proposed new activities makes up the total work needed to support managed wetland operations. Increasing the current level of work and implementing the new activities would help SRCD and DFG meet the SMP managed wetland goals related to levees and flood and drain cycles. This EIS/EIR describes the impact resulting from the work above the existing baseline condition. The baseline for each activity and the proposed change in each activity are shown in Table 2-5. The analysis of impacts on resources is based on the change for each activity. All activities would be implemented by DFG, landowners (as represented by SRCD), and/or DWR except as noted. A full description of each activity is provided following Table 2-5.

Table 2-5. Baseline and Proposed Change in Currently Implemented Managed Wetland Activities

Managed Wetland Activities	Annual Baseline Activities (Average, Low–High)	Current Corps Permitted Annual Limits	Anticipated Change from Baseline with SMP Implementation
Repair existing interior levees	29,228 cy, 9,697–54,040	443,000 cy	Slight increase (10% or less of annual baseline)

Managed Wetland Activities	Annual Baseline Activities (Average, Low–High)	Current Corps Permitted Annual Limits	Anticipated Change from Baseline with SMP Implementation
Repair existing exterior levees	43,902 cy, 28,622–87,232	443,000 cy	Decrease
Core existing interior levees	6,380 cy, 2,022–15,108	No limit	No change
Grade pond bottoms for water circulation	147,377 cy, 79,750–228,546	1,772,000 cy	Decrease
Create pond bottom spreader V-ditches	40,403 linear feet, 14,500–72,300	1,438,000 linear feet	No change
Repair existing interior water control structures	24, 10–37	No limit	No change
Replace pipe for existing interior water control structures or install new interior water control structures	20, 14–38	No limit	Slight increase (10% or less of annual baseline)
Install new blinds and relocate, replace, or remove existing blinds	38, 23–51	5 per ownership annually	No change
Disc managed wetlands	2,552 acres, 1,837–3,100	No limit	No change
Install drain pumps and platforms	1, 0–2	No limit	No change
Replace riprap on interior levees	50 cy, 0–300	Obtained as needed	No change
Replace riprap on exterior levees	2,435 cy, 292–7,406	Limited to replacement of existing riprap	No change
Repair exterior water control structures (gates, couplers, and risers)	17, 8–28	No limit	No change
Install or replace pipe for existing exterior flood or dual-purpose gate	11, 1–23	50 annually Marsh-wide	No change
Install, repair, or re-install water control bulkheads	11, 3–21	No limit	No change
Remove floating debris from pipes, trash racks, and other structures	20 cy, 10–50	Obtained as needed	No change
Install alternative bank protection such as brush boxes, biotechnical wave dissipaters, and vegetation on exterior and interior levees	450 ft, 300–600	Obtained as needed	No change
Construct cofferdams in managed wetlands	1 unit, 0–2	Obtained as needed	No change
Repair and maintain Suisun Marsh salinity control gate	1, 0–2	Obtained as needed	No change

Managed Wetland Activities	Annual Baseline Activities (Average, Low–High)	Current Corps Permitted Annual Limits	Anticipated Change from Baseline with SMP Implementation
Clean roaring river distribution system fish screen	Oct daily Nov–Sept weekly	No limit	No change
Install new fish screen facilities	2 units, 0–5	Obtained as needed	No change
Salinity monitoring station repair and replacement	2 stations, 0–18	Obtained as needed	No change
Relocate, install, or remove salinity station	1 station, 0–5	Obtained as needed	No change
Construct new interior ditches; clear existing interior ditches	49,456 cy, 9,724–69,022	443,000 cy	Slight increase (10% or less of annual baseline)

cy = cubic yards.

Repairing Existing Interior and Exterior Levees

This action involves the improvement or repair of levees by using spoils from other permitted activities such as clearing interior ditches, constructing new interior ditches, or grading pond bottoms. Vegetation growth on levees can require mowing to maintain condition and to assess repair needs. The spoils would be placed on the crown of the levee with an excavator, dozer, or box scraper. On rare occasions, exterior levee integrity is compromised, (from rodent holes, storm damage, or unanticipated overtopping of the levee crown), allowing uncontrollable tidal flows to enter the managed wetland which can cause levee breaches. If the exterior levee breach can be repaired utilizing on site material consistent with existing permit terms and conditions, the levee integrity is restored on the next appropriate low tide cycle. See managed wetlands environmental commitments for additional discussion of this activity. Aggregate base rock may be placed on the crown of levees to prevent road surface degradation. Work generally would occur in late summer, and approximately 500 linear feet of levee can be repaired per day.

Coring Existing Interior Levees

The coring of levees is intended to stop the flow of water through rodent holes and cracks in levees. To core a levee, typically a 2-foot-wide trench (depending on the width of the excavator bucket) is excavated in the levee crown using a long-reach excavator or backhoe, and the material is placed on the crown of the levee adjacent to the excavation site. The trench then is backfilled immediately using the same material that was excavated. The material is compacted during the backfilling process to seal the levee. If a rodent hole is identified, its entire length may need to be excavated to stop the flow of water and prevent future

burrowing by small mammals. Coring of levees generally is performed between July and September, and approximately 700 feet can be completed in 1 day.

Grading Pond Bottoms for Water Circulation

To improve water circulation by re-contouring low areas and raising pond bottoms and provide material for levee maintenance, material is graded from high-ground areas or pond bottoms. The raising of low pond bottom areas improves circulation and drainage in the managed wetlands. Grading also can include the creation or maintenance of swales, typically 2 feet deep with gradual slopes. This work is completed with a box scraper pulled by a low–ground pressure dozer or tractor. Work generally is done June through August. Approximately 700 cubic yards (cy) can be graded per day.

Creating Pond Bottom Spreader V-Ditches

V-ditches are 18-by-18-inch or 24-by-24-inch ditches created by pulling a V-ditch plow behind a tractor. These V-ditches facilitate circulation and drainage of low areas and sinks. Occasionally, a ditch may be constructed in high areas to improve drainage by connecting an isolated wet area to other draining wet areas. Typically, these ditches silt in quickly and last only 1 to 2 years after creation. These ditches normally are created after the ponds have drained for the season, generally June through August, and 2,000 feet can be constructed per day. Spoil materials typically remain on the sides of the V-ditches, although they may be spread back into the pond bottom to further improve the low areas, or they can be flattened adjacent to the V-ditch.

Repairing Existing Interior Water Control Structures

This repair involves the replacement of component parts of pipes through interior levees (gates, stubs, or couplers) but not replacement of the pipe itself. Work is done by hand (uncoupling the old structure and re-coupling the new structure), and generally a ground crew removes the damaged structure and installs the new structure on the end on the existing pipe. This work typically is completed in the summer, when the managed wetlands are dry.

Replacing Pipe for Existing Water Control Structures or Installing New Interior Water Control Structures

This activity includes the replacement of a pipe for an existing interior water control structure or the installation of a pipe for a new interior water control structure. If a new structure is being installed, the new structure is assembled on the crown of the levee, a trench is excavated laterally through the levee, the new pipe is placed in the trench, the trench is backfilled, and the fill is compacted. If

a pipe is being replaced, the trench is excavated at the site of the old pipe and that pipe is removed. Similar to installing new pipe, the replacement pipe is placed in the trench and backfilled. However, when feasible, new drainage pipes would be placed where they can be consolidated or drain into an existing ditch. Occasionally, an interior ditch cannot be drained sufficiently for pipe replacement. In these instances sheetpiles may be used to retain the water temporarily until the pipe is replaced.

Many water control structures have walkways that run from the levee to the end of the pipe. These walkways include pilings, walkway boards, and handrails. These structures strengthen the gate by providing a grounded structure for frame attachment, and they provide a means by which wetland managers can access the gate for operation. Any necessary repair to these structures typically is done during pipe replacement. However, some repairs may need to be done more frequently, especially replacement of walkway boards or handrails.

This work typically is completed in the summer when the managed wetlands are dry.

Installing New Blinds and Relocating, Replacing, or Removing Existing Blinds

Duck blinds are plastic, fiberglass, or metal structures (3’ x 4’ x 8’) placed in the ground to conceal the hunter. When an in-ground blind is replaced, the old blind is excavated from the ground, and a new blind is placed in the void, which can be as deep as 4 feet. This work is completed with a dozer and/or excavator. The blind is placed and secured with vertical timbers and cross timbers that are pushed into the ground adjacent to the blind. Then material from the pond bottom is graded to conceal the sides of the blind.

Discing Managed Wetlands

Discing is done on the landside of levees in the spring or late summer to clear problematic vegetation, reduce the production of vector mosquitoes, break up the soil for seedbed preparation, smooth excavated material, fill cracks in soil, or create fire breaks. A disc is pulled behind a tractor or dozer. Depending upon the wetland management and vegetation objectives, discing can occur annually in upland areas to promote annual grasses and cereal grain production and once every two to five years in wetland areas to set back plant succession. Discing is voluntarily limited to one-fifth of a property area per year (Suisun Resource Conservation District 1998).

Installing Drain Pumps and Platforms

Drain pumps are installed on wooden platforms built to support them. The pump and platform are installed on the inland side of the exterior levee. Occasionally, the pump discharge pipe will be set high in the profile of the exterior levee so that the pipe does not limit levee access but allows discharge at high tidal levels.

Replacing Riprap on Interior Levees

Riprap is replaced on interior levees in the minimum amount necessary for bank stabilization and in areas around water control structures where water flow and eddies erode the ditch bank and interior levee toe. Riprap will be placed on interior levee banks only in those areas with existing riprap. Riprap is placed on the interior levees using a long-reach excavator that is located on the levee crown. Approximately 300 feet of riprap can be placed per day. Riprap generally is replaced during July through September.

Replacing Riprap on Exterior Levees

Riprap is replaced on the tidal side of exterior levees in the minimum amount necessary for bank stabilization. Riprap will be placed on exterior levee banks only in those areas with existing riprap. Those areas that receive direct wave impacts historically have been fortified with riprap and require periodic maintenance. Riprap is placed on the tidal side of exterior levees using a long-reach excavator that is located on the levee crown, or by barge with a dragline or clamshell dredge. The barge method is used less frequently as it requires greater channel widths and depths and is more expensive. Riprap generally is replaced during July through September.

Coring Existing Exterior Levees

This activity is the same as described for interior levees.

Repairing Exterior Water Control Structures (Gates, Couplers, and Risers)

Repairing exterior water control structures involves the replacement of components of pipes through exterior levees (gates, stubs, or couplers) but does not involve the replacement of the pipe itself. All work is completed at low tide to allow access to the pipe and typically does not involve any excavation of sediments from the exterior slough. The repairs are generally done during July through September. In-water work is done by hand (uncoupling the old structure and re-coupling the new structure), and generally a ground crew lifts the damaged structure out of the water and lowers the new structure into place.

Installing or Replacing Pipe for Existing Exterior Flood or Dual-Purpose Gates

This activity is the replacement of an exterior water control structure (pipe, gates, stubs, and couplers) that is used to either flood or drain managed wetlands. There are no restrictions on the size of a draingate. For floodgates and dual-purpose gates (flood and drain) that divert water from tidal sloughs, however, the overall capacity of the diversion for that parcel may not be enlarged. In the past, water control structures typically were constructed of corrugated metal pipe. Because of the corrosive environment of the Marsh, these pipes often begin leaking and fail in 8 to 15 years. If an exterior pipe leaks, habitat management and maintenance activities would be compromised as a result of uncontrollable flooding of the managed wetland. Therefore, metal pipes typically are replaced with high-density polyethylene (HDPE) pipes.

When a pipe is replaced, a new pipe and appurtenant structures are assembled on the crown of the levee with the appropriate control structure components attached to each end of the pipe. A trench is excavated in the exterior levee over the old pipe, and the pipe is removed. All replacement activity is completed in one low tide. Replacement pipes typically are placed in the same location as the existing structure, the trench is backfilled, and the backfilled material is compacted. Either a dozer or an excavator is used to excavate the trench, and generally an excavator is used to install the replacement pipe. The backfill material is compacted with a dozer and/or excavator. Replacement of the pipes takes approximately 4 days and generally would be done March through September. The first day is mobilization of equipment and materials, the second day is assembly and preparation for installation, the third day is installation, and the fourth day is demobilization and site clean-up.

If a new drainpipe is required, it would be installed at a location where discharge channels already exist or exterior levees have minimal vegetation. The new structure is assembled on the crown of the levee, usually with a flap gate or screw flap on the outside and flashboard riser or screw gate on the inside. Installing a new drainpipe requires the same types of equipment and takes the same amount of time as replacing an old drainpipe.

Installing, Repairing, or Re-Installing Water Control Bulkheads

Bulkheads are built to stabilize and strengthen levees exposed to highly energetic water flows or wave energy. These structures typically are installed near water control structures and prevent the erosion of soils at the toe of the levee and ditch banks. Exterior work is done at low tide and does not involve any excavation of sediments from the exterior slough. In-water work is done by hand (unbolting the old boards and/or bolting a new structure together), and generally a ground crew lifts the old boards out of the water and lowers the new boards into place. A new bulkhead may be constructed to strengthen newly excavated sections of

levee, and to help avoid additional turbidity after installation of exterior water controls by containing loose soils that otherwise may fall into the exterior slough. Bulkheads can be constructed from wood or vinyl or metal sheetpile. This activity generally would be implemented in the summer months.

Removal of Floating Debris from Pipes, Trash Racks, and Other Structures

Floating vegetative debris and other debris, such as wood and trash, often accumulates in front of pipes, trash racks, and other structures. This debris typically is removed using a long-reach excavator. Material is disposed of outside of the Suisun Marsh. Work is done annually, generally during the summer months.

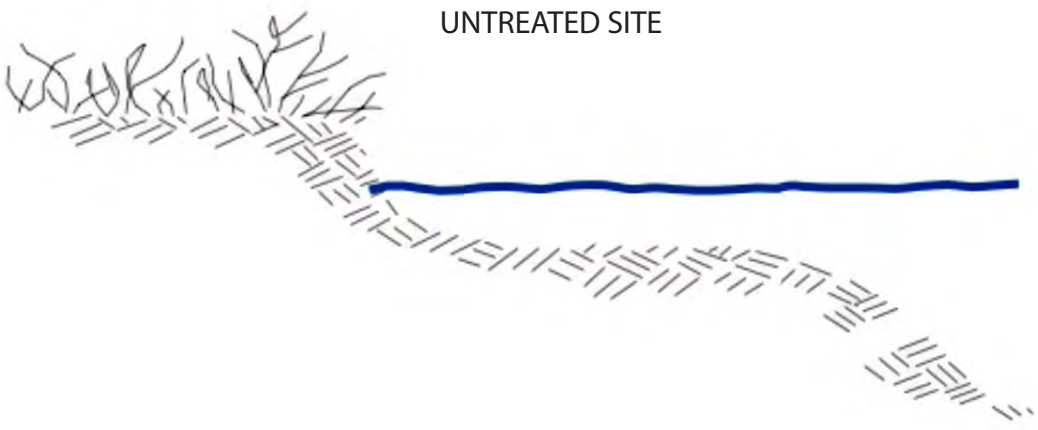
Installing Alternative Bank Protection such as Brush Boxes, Biotechnical Wave Dissipaters, and Vegetation on Exterior and Interior Levees

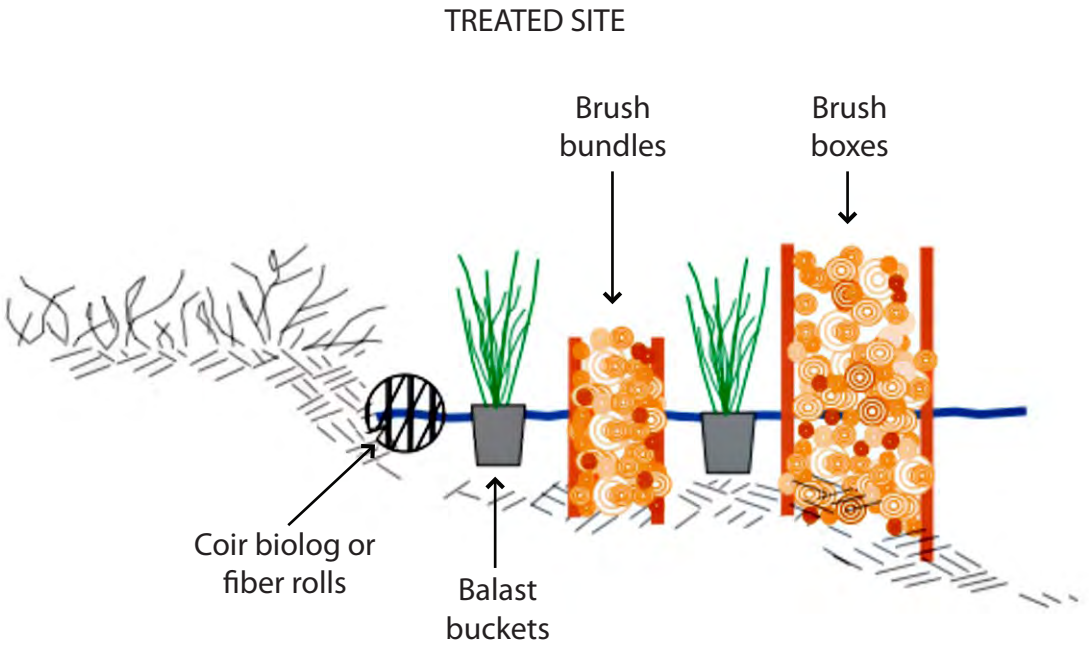
As described above, vegetation applications, including brush boxes, may be appropriate and effective mechanisms for controlling erosion of levees. Pursuant to previous BOs from NMFS and the USFWS, SRCD was required to employ levee maintenance methods that do not use riprap. Brush boxes use natural materials and native plants for capturing sediment to stabilize and protect exterior levees while also providing fish habitat (Figure 2-2). The installations generally are done during July through September.

Brush boxes, brush bundles, and ballast buckets are placed below the mean high water mark and anchored with tree stakes. Brush boxes and brush bundles are generally dead branches that are staked into the ground or wrapped in coconut fiber (Figure 2-2). Ballast buckets are organic, biodegradable buckets planted with native wetland species such as tule, three-corner bulrush, and Baltic rush. As the technology is developed further, alternative materials or installation methods may be used. The installation of brush boxes and ballast buckets does not involve any in-water work because all work is done at low tide. This work is done entirely by hand, reducing the sedimentation that can occur with mechanical work. After the build-up of sediment and the growth of native plants over time, the exterior levee would be stabilized and protected from further erosion, and habitat would be established for fish and the macroinvertebrates on which they feed.

Integrated vegetation solutions are desirable to provide low maintenance “living” bank protection and wave-energy dissipation. Applications of these solutions are limited by the local channel velocities and depth, wind fetch, and exposure to wake. If the tidal hydraulic regime is suitable for the establishment of vegetation capable of resisting high channel velocities and wave energy, vegetation will be incorporated into the erosion protection design. This would reduce the future

DESIGN FOR LOW BANK, MODERATE SLOPE





Composite Brush Works/Ballast Buckets

Composite protection and habitat enhancement techniques include brush boxes to serve as breakwaters, coir-wrapped brush bundles to capture sediment, and ballast-bucket plantings for habitat establishment.

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Figure 2-2
Composite Brush Works/Ballast Buckets

maintenance costs of erosion protection. The following criteria would be considered in determining the appropriateness of vegetation, either by itself or in combination with riprap, at each site.

- When channel velocities are low enough to prevent loss, vegetation solutions can be installed to halt erosion processes along levee slopes and natural channel bank sections.
- If channel depth on the face of the levee slope is less than 3 feet below mean tide level (MTL), i.e., mid tide level, and the levee slope is less than 3:1 (H:V), vegetation solutions can be installed to halt erosion processes along levee slopes and natural channel bank sections.
- If levee slopes can provide suitable foundations, brush boxes can be installed at various elevations to create a "benched" sequence up the slope and reduce or stop erosion in areas where scallop failures have occurred.
- If shallow water, shallow slopes, benches, or shoal exists, vegetation can be installed to greatly reduce wake energy and provide a low-maintenance erosion-reduction measure.
- If fetch length is less than 1,000 feet in the direction of the predominant southeast to southwest winds during high-water conditions (e.g., winter storms, spring tides) or prevailing winds during all other times (typically from the west), vegetation solutions should be applied to the upper slope of the levee to dissipate wind-driven waves and reduce erosion potential.

Constructing Cofferdams in Managed Wetlands

Cofferdams are temporary earthen structures used to cross interior ditches or prevent interior water from flowing into construction sites, in support of other permitted construction activities (e.g., exterior pipe replacement) and required best management practices (BMPs). Cofferdams are temporary in nature and are constructed from material from the levee toe, pond-bottom grading, or other excavated areas in the managed wetlands. The volume of material used to transverse the ditch is limited to that required to stop the flow of water and provide adequate width to support equipment access to both sides of the ditch. During installation, a long-reach excavator or dozer places or pushes material from the adjacent levee crown or field area into the ditch. Upon completion of the associated work activities, the cofferdam or crossing is excavated and removed from the ditch and the ditch is restored to its original width and depth. Upon removal of the cofferdam, all material is placed on the crown and backslope of the exterior levee or is spread out over the adjacent interior ditch bank or levee. An alternative to cofferdams is a sheetpile that can be driven into the levee with a long-reach excavator and removed upon completion of construction. Sheetpiles could be used instead of or in conjunction with cofferdams. This activity generally would be implemented in the summer months.

Suisun Marsh Salinity Control Gate Repair and Maintenance

Flashboards are installed and removed on an annual basis by means of either a land-based crane on the banks of Montezuma Slough or a barge crane. Repairs and maintenance include servicing, replacing, and installing sections and pieces of the radial gates or boat locks that are connected to or associated with the entire facility. Most work is done above water from a boat or the superstructure while sections are hoisted out of the water. This activity is conducted by DWR.

Roaring River Distribution System Fish Screen Cleaning

The fish screens are cleaned by successively lifting each of the stationary vertical screen panels out of the water and pressure washing the silt and vegetation accumulation off of the screens. During the flood-up season (generally August through October), this activity can be conducted up to once a day. During the rest of the year, this activity is conducted less frequently on an as-needed basis. This activity is conducted by DWR.

Installing New Fish Screen Facilities

Fish screens are installed at managed wetland water intakes (flood pipes) to prevent fish from swimming or being drawn into managed wetlands. The installation of fish screens was permitted in the 1995 RGP (diversions are screened.)

Wetland impacts from screening diversions to protect fish would not exceed 1,000 square feet per year or a total of 30,000 square feet over the 30-year plan period. All Suisun Marsh screens would be designed to comply with USFWS delta smelt approach velocities of 0.2 foot per second (fps), which are well below required approach velocities for salmon.

There are many different designs for fish screens in the Delta and Suisun Marsh. Site-specific considerations, such as acreage served, diversion volume, and channel and diversion point configuration, will dictate screen design. The stainless steel conical 8-foot, 10-foot, and 12-foot fish screens have proven most efficient design for small diversions screened in Suisun Marsh. These screens were designed to be removable from the crown of the exterior levee with a standard boom truck or excavator. This aspect of the design allows normal maintenance to be conducted in the dry, and the screens can be removed from the tidal slough and placed on a storage platform for inspection and maintenance. Normal maintenance includes power washing the screens, replacing cathodic protection (zinc or magnesium anodes), replacing cleaning brushes, and general inspecting.

Typically, fish screens are installed at an existing diversion structure; therefore, there is an existing channel or basin in the tidal area and a supply ditch in the managed wetland. However, consolidation of unscreened diversions may require a new diversion location to serve multiple wetland units at one location. The fish screen platform is supported by four pilings that are pushed into the bay mud at the toe of the exterior levee. The conical fish screen support platform and diversion pipe are placed on top of these support pilings and installed through the exterior levee. These construction methods are similar to exterior pipe replacement and bulkhead repair or installation. All other work activities for screen installation are completed at the toe of the exterior levee on the landside of the levee. These activities include water control installation, storage platform construction, and control center platform installation. This activity generally would be implemented in the summer months.

Salinity Monitoring Station Maintenance, Repair, and Replacement

Infrequent major maintenance activities do not include work done in the water. This includes repairs to walkways, equipment housing, or other wood, plastic, or metal structures. This also includes installation, removal, replacement, repair, or modification of monitoring instrumentation within the equipment housing. These activities are done twice per year.

Weekly maintenance activities include collecting data from the electronic equipment at the site and the calibration and cleaning of the probes. With the exception of lowering the probes in the water, these activities are done above the water or adjacent to the water on the levee bank.

Activities to be conducted periodically in the water by hand include cleaning or replacing the probe mounting equipment, resetting the water stage gage, cleaning probe pipes, and replacing the dimple collar to suppress wave action. On the remaining stations with stilling wells, clearing accumulated sediment from the stilling well is done by flushing the stilling well with water pumped from the adjacent area.

Stilling well replacement and walkway/platform piling replacement involves removal by tractors and trucks operated from the existing roadway/levee and excavators or cranes operated from the roadway/levee or barge. Work generally is scheduled during the dry months of summer and fall. This activity is performed by DWR about once every 5 to 10 years at a site.

DWR gradually is moving away from the use of stilling wells and moving toward using pressure transducers to measure water surface elevation. Pressure transducers (as well as the other transducers in the bundle) are suspended in the water above the bottom. This activity is conducted by DWR.

Salinity Station Relocation, Installation, and Removal

Salinity stations may need to be relocated, installed, or removed because of regulatory requirements, physical constraints, the need to obtain more reliable data, the data no longer being required, or other reasons. Maintenance equipment may include trucks, bucket excavators, small cranes, boats, barges, and other equipment as required. Work generally is scheduled during the dry months, June through September.

When a salinity station is removed, it is done by hand when feasible. Otherwise, tractors and trucks operate from the existing roadway/levee and excavators or cranes operate from the roadway/levee or from barges. All components of the station will be removed. This includes the stilling well culvert, and pilings supporting the walkway will be removed from the levee slope/river bottom. Materials from the removed station are disposed of at an approved off-site location. The total disturbance would not exceed 400 square feet. The removal of a monitoring station usually takes about 8 hours over the course of approximately 3 days.

New monitoring stations are installed on a levee when possible or in water when location on a levee is not feasible. A new station may include installation of salinity measurement equipment with equipment housing. Stations that cannot be located on the levee also will require a platform to support the equipment housing, a walkway to access the platform, and pilings to support the platform and walkway. Stilling wells may be installed. Alternatively, pressure transducer equipment will be attached to structures in the water, such as pilings, to enable measurements to be taken in the water column without requiring disturbance of the substrate during installation or maintenance. The footprint for the walkway (actual fill) is less than 2 cubic feet. Installation of a monitoring station usually takes approximately 4 days, involves the use of a truck to haul equipment, and may require an excavator and small boat to install the stilling basin. The total disturbance would not exceed 50 square feet. This activity is conducted by DWR.

Modification of Currently Implemented Activities

Only three activities currently implemented would be modified under the SMP. The activities themselves—clearing existing interior ditches, constructing new interior ditches, and repairing existing exterior levees—would not change, but how the activities are administered would change. These activities would be implemented by DFG, landowners (as represented by SRCD), and/or DWR. This includes RRDS, MIDS, Goodyear Slough Outfall, and other facilities and/or properties.

Clearing Existing Interior Ditches

This action is the removal of accumulated silt, emergent vegetation, and aquatic vegetation from interior ditches with an excavator to eliminate water-flow restrictions. Approximately 900 linear feet of ditch can be cleared in 1 day. The RRDS includes a square-shaped 40-acre intake area that receives water from the water control structures behind the fish screen and allows sediment to settle out of the water prior to it flowing into the RRDS ditch. Although this area is not linear like a ditch, it is similar to ditches due to being an area with open water, boarded by levees, which may have emergent vegetation growth due to excess silt accumulation. Removal generally would be done during the months of June through September. A long-reach excavator, harvester, or other drag methods may be used to remove the material.

The material would be spread evenly on adjacent land. However, spoils also may be sidecast and left adjacent to the ditch for up to 1 year, then must be used for an authorized activity (levee maintenance or grading) or removed to an area outside Corps jurisdiction (crown of a levee). In this case, spoils are moved using a dozer or box scraper. Currently, sidecast materials may be left in place to dry for only a month. SRCD, DFG, DWR, and Reclamation propose that this period is extended to a year to ensure that all materials are dried before put to beneficial use.

Constructing New Interior Ditches

This action is the removal of pond bottom material with an excavator to create a new interior ditch for improved water circulation. Approximately 600 linear feet of ditch can be constructed in 1 day, and work generally would be conducted during the months of June through August. A long-reach excavator may be used to remove the silt and spread materials evenly on adjacent land. However, spoils may be sidecast and left adjacent to the ditch for up to 1 year; then they must be used for an authorized activity (levee maintenance or grading) or removed to an area outside Corps jurisdiction (crown of a levee). Spoils are moved using a dozer or box scraper.

Similar to clearing existing ditches, sidecast materials currently may be left in place to dry for only a month. SRCD, DFG, DWR, and Reclamation propose this period be extended to a year to ensure that all materials are dried before put to beneficial use.

Repairing Existing Exterior Levees

The most common practices for repairing exterior existing levees in Suisun Marsh involve the removal of accumulated silt and vegetation from water circulation ditches in managed wetlands and placement of spoil material on the crown of adjacent levees to raise the crown to its original or design height, and/or

improvement of interior side slopes. Materials may be imported from an upland source within or outside the Marsh for beneficial uses of dredged materials or from the LTMS. A potential additional material source, dredging from tidal sloughs, is described below under New Activities.

Repair of existing levees typically occurs from June through September. Approximately 800 linear feet can be completed in 1 day.

It is unlikely that a significant amount of levee repair material would be lost to the outboard side of an exterior levee below the mean high water line. Any material that might trickle down the outside slope of the levee from the crown probably would not affect vegetated areas and may cause only slight and very temporary turbidity.

This activity currently is limited based on acreage of each parcel protected by the exterior levee. The proposed change is to limit work based on actual lineal footage of each ownership. This change is proposed because some small-acreage properties may have significant lengths of exterior levee (e.g., a long, narrow parcel), and a large acreage property may have minimal or no exterior levees but be protected by the small property exterior levee. This administrative change would provide landowners with a more appropriate limit for maintenance of exterior levees. Placement of up to 1.5 cy of levee material per linear foot on average for annual work activities would occur. One levee segment may require no work in a given year, and a different levee segment may require 3.0 cy per linear foot because of flood damage. This would average out over the individual property's total levee system. This slight change in how permitted volumes are calculated is not expected to change the overall patterns of activities conducted in the Marsh. However, the frequency of work is expected to increase to meet the enhancement objective.

New Activities

New activities are activities that have not been implemented in the Marsh, or that have not been implemented in so long that they are not considered part of the existing baseline condition. These new activities would be implemented by DFG, landowners (as represented by SRCD), and/or DWR. This includes RRDS, MIDS, Goodyear Slough Outfall, and other facilities and/or properties. These new activities are described below.

Dredging from Tidal Sloughs as Source Material for Exterior Levee Maintenance and to Remove Sediment around Fish Screens and Other Areas

A dredging program would be implemented to provide materials for deferred and anticipated levee maintenance needs. A total of 3 million cy of materials would be dredged from major and minor tidal sloughs and bays over the 30-year SMP

implementation period. However, over time, as tidal restoration occurs, the number of exterior levees in the Marsh may decrease, thus reducing the amount of dredging required to maintain Marsh levees. This may occur under all three alternatives, with Alternative B having only a slight reduction, Alternative A having a moderate reduction, and Alternative C having a substantial reduction. Based on the tidal restoration proposed in each alternative, it is expected that dredging needed for Alternative A (Proposed Project) could be reduced by 15% (total of 85,000 cy annually), Alternative B could be reduced by 9% (total of 91,000 cy annually), and Alternative C could be reduced by 20% (total of 80,000 cy annually). These reductions in dredging would occur over time and would be concurrent with the implementation of the restoration. This activity would be performed during the dredging windows of August through November.

Up to approximately 100,000 cy of material would be dredged annually. However, as described above, as tidal restoration occurs, the number of exterior levees in the Marsh may decrease, thus reducing the amount of dredging required to maintain Marsh levees. The annual allotment would be divided between state and private property, depending on need, and limited to 2.1 cy per linear foot of channel, based on the linear extent of exterior levees on each property or the length of dredger cut. This limitation would be provided as a general guideline; however, flexibility would be necessary in case of special conditions, such as catastrophic levee failure. The proposed volume may be reduced, in any given year, if supplemental material is available through beneficial reuse of suitable dredged materials (i.e., LTMS or other operations).

Some exterior levee segments have vegetation growth on the levee toe that extends out into the bay and/or slough. Repair of levee segments with this vegetation would be avoided if the tidal berm is more than 50 feet wide. Dredging could be done within dredger cuts, which transect wide berms, and salinity stations located on the edge of such berms. Dredging from the center channel will be done to avoid emergent vegetation and other areas with vegetation will be avoided. The approximate cubic yards and acreage of other habitat types per region proposed for dredging per year is shown in Tables 2-6 and 2-7. Minor sloughs include all sloughs except Montezuma and Suisun. Dredger cuts are small, linear channel areas isolated by or transecting a vegetated berm. These are channels which were created immediately adjacent to the toe of the exterior levees during original levee construction or are channels that run from water control structures to bays or sloughs that were previously created to facilitate water drainage.

Table 2-6. Proposed Dredging Volume of 100,000 Cubic Yards Distributed per Habitat Classification and Plan Region

Feature	Region 1 Volume (cy)	Region 2 Volume (cy)	Region 3 Volume (cy)	Region 4 Volume (cy)	Montezuma Slough Volume (cy)	Total Volume (cy)
Bays	0	0	100	4,000	0	4,100
Major Sloughs	2,100	10,700	0	0	16,000	28,800
Minor Sloughs	21,600	8,900	3,000	2,400	0	35,900
Dredger Cuts	6,300	2,700	4,500	10,500	7,200	31,200
Total	**30,000**	**22,300**	**7,600**	**16,900**	**23,200**	**100,000**

Table 2-7. Annual Acreage of Dredging per Habitat (acres)

Feature	Region 1	Region 2	Region 3	Region 4	Montezuma Slough	Total Acres
Bays	0	0	0.02	0.79	0	0.81
Major Sloughs	0.42	2.12	0	0	3.16	5.7
Minor Sloughs	4.28	1.76	0.61	0.48	0	7.13
Dredger Cuts	1.25	0.54	0.89	2.08	1.43	6.19
Total	**5.95**	**4.42**	**1.52**	**3.35**	**4.59**	**19.83**

Dredging activities would be tracked by SRCD using GIS to ensure that it does not occur more than once every 3 years in any location, and would not remove material deeper than 4 feet per dredging cycle. The actual dredging locations would be based on needed levee improvements, but would be limited by region, annual limits, habitat types, and frequency in any one location as described above.

A clamshell dredge or long-reach excavator could be used to dredge in the Marsh. The long-reach excavator could dredge from the levee crown or from a barge. Clamshell dredging could take place either from a barge within the slough channel or from the top of a levee, depending on restrictions caused by vegetation on channel banks or the width of a channel. Barge clamshell dredges are not self-propelling and therefore would need a small tugboat to maneuver within the channel. From a barge, the operation would begin when the bucket assembly, attached by a boom (up to 100 feet), is lowered into the channel to collect sediments. It would scoop up to 5 cy of consolidated bay mud and deposit it on the landside of the levee or crown adjacent to the channel. In limited instances, materials may be used for exterior levee maintenance in areas not adjacent to the dredged material source. The clamshell dredge or long-reach excavator may sit atop the levee and scoop up to 5 cy of consolidated bay mud from the channel bottom, using the same method as from a barge, and deposit the

dredged material on the landside backslope, crown , or the levee slope on the bay/slough side if it is devoid of vegetation.

Once material is placed, an excavator bucket would be used to compact the material against the levee to make it as smooth as possible. After 2–3 months of drying time, the material would be disced and graded to integrate the new materials with the existing levee. Minimal materials enter the interior managed wetland or bay/slough because the materials are deliberately placed and kept on the crown and slopes of the levee.

Dredging could occur in the center of slough channels, adjacent to water control structures or culverts, in salinity station locations, in the location of the Suisun Marsh Salinity Control Gates, adjacent to fish screen structures, and in historical dredger cuts. Some exterior levee segments have vegetation growth on the levee toe that extends out into the bay and/or slough. Repair of levee segments with this vegetation would be avoided by not dredging adjacent to tidal berms more than 50 feet wide, dredging from the center channel to avoid emergent vegetation often found along levee slopes, and avoiding other areas with vegetation. Dredging in human-made dredger cuts, which are linked directly to the water control infrastructure of the managed wetlands, fish screens, and in transect wide berms would improve drainage issues that have resulted from siltation. Siltation in some instances has restricted flap gates from opening, dammed water in the drainage channel, and clogged trash racks. This reduces the management capabilities and habitat quality on managed wetland units and reduces the effectiveness of state/federal facilities.

Similarly, some of the 16 fish screen structures and the RRDS fish screen experience significant siltation problems. Silt is deposited around these screens, which impedes the operation of the screen and screen-cleaning brushes. Every few years a relatively small amount of material would be removed from the fish screen basins (about 20 to 100 cy each) by dredging. (This amount is included in the total 3 million cy proposed for dredging in the Marsh.) Alternative measures (trying to move silt by hand) have been ineffective. Dredging around fish screens would be done during low tide to minimize in-water work and minimize turbidity. As the tide returns, the fish screen would be opened to allow turbidity to be drawn into the managed wetland. Dredge spoils would be placed on the crown or landside slope of the exterior levee adjacent to the fish screen. In instances where material cannot be used adjacent to the dredging site, the material may be used on other levees within Suisun Marsh, following the same environmental commitments as identified in the plan.

Placing New Riprap in Areas That Were Not Previously Riprapped

The levee system in Suisun Marsh is continually under the pressure of tidal stage, wind fetch, eroding currents, and boat-wake damage. With sea level rise and climate change these pressures are expected to increase. Over time, protective vegetated berms and levee toes erode and expose the levee foundation to the

erosive forces of wind, water, and logs. Many of the areas that require riprap have been treated, and their continued maintenance is described above. This activity addresses those areas that currently do not have riprap but that may be determined in the future to require such treatment.

This new activity would place up to 6,000 linear feet of new riprap over the 30-year plan period on the side slopes of interior water conveyance ditches and up to 2,000 linear feet of new riprap on the side slopes of exterior levees on newly exposed areas not previously riprapped. (This is in addition to the replacement of riprap described above.) No more than 200 linear feet of new riprap would be placed annually. Riprap is placed on the levee using a long-reach excavator or a clamshell or dragline dredge. Placement of riprap would be done from June through September. Riprap materials are transported to the site with a 10-wheel dump truck with a capacity of 16 cy or by barge with a 400 cy capacity. For interior levees, this activity is needed occasionally where the velocity of water flowing through an exterior water control structure causes scouring eddies and bank erosion of inter-levee toes.

New riprap would be placed only when it has been determined that the specific conditions of each site would not support other types of erosion control. Riprap would be applied only under the following circumstances:

- Levees exposed to channel velocities that are too high to support vegetation. Depending on soil type, it may be possible for levee material to withstand short durations that exceed 6 fps.
- Channel depth on the face of the levee slope is deeper than 3 feet below MTL and the levee slope is steeper than 3:1 (H:V); riprap would be applied to reduce erosion potential without consideration for incorporation of vegetation.
- Levee face typically is exposed to vessel wakes year-round and not located in a 5-mph zone; riprap would be applied in area where erosion persists.
- Fetch length exceeds 1,000 feet in the direction of the predominant southwest to southeast winds during high water conditions (e.g., winter storms, spring tides) or prevailing winds during all other times (typically from the west); riprap would be applied to the upper slope of the levee to dissipate wind-driven waves and reduce erosion potential.

Where new riprap is placed, integrative vegetation also would be applied where it is biologically appropriate.

If new riprap is placed on either interior or exterior levees, BMPs would be implemented to reduce the environmental effect as described below in the Environmental Commitments section.

Constructing New Interior Levees for Improved Water Control and Habitat Management within the Managed Wetland Units

Interior levees are embankments that allow management of water inside exterior levees on the managed wetlands. The interior levees are not exposed to tidal action. The purpose of interior levees is to isolate specific areas within the managed wetland to allow independent water control or different water elevations in those areas. The crown width of these levees is normally 10 feet or less, with a crown height of 3 feet above pond bottom, 1 foot of freeboard, and a side slope of 2:1 on both sides.

Interior levees can be constructed in numerous ways: (1) by excavating a new or existing water conveyance ditch and stacking the excavated material to create an interior levee, (2) recontouring a ponded area and pushing up material with a dozer, (3) placing material with a box scraper to create a levee from high ground or pond bottom areas, or (4) importing materials and placing with an excavator or dozer. Interior levees generally would be constructed during the summer months when managed wetlands are dry. Approximately 400 feet of levee can be constructed per day.

Preservation Agreement Implementation Fund

The SMPA PAI Fund is proposed to fund certain permitted activities to support mitigation obligations for the CVP and SWP operations. It is funded by DWR and Reclamation as part of the CVP and SWP mitigation for impacts on the Marsh, as described in the Revised SMPA. The PAI Fund would not include activities beyond what is described above for managed wetland activities, but rather would provide a funding mechanism for landowners to perform needed improvements more frequently for improved water management capabilities to fulfill Reclamation and DWR mitigation obligations. As described below, the PAI Fund applies only to specific work activities.

The PAI Fund would be part of a mitigation strategy for the effects of the CVP and SWP operations on water quality in the Marsh. The PAI Fund would contribute to the funding of some activities needed to improve managed wetland facility operations by establishing a single cost-share funding mechanism that combines the three formerly proposed SMPA Amendment 3 actions into the PAI Fund. The type of improvement determines which cost-share program would apply. These activities would remain as distinct elements under the new PAI Fund, consistent with the objectives and guidelines of each program, cost-share requirements, and regulatory permitting compliance requirements.

The Joint-Use Facility Improvements (JUFI) program would provide funds on a 75/25 cost-share basis for infrastructure improvement to increase efficient and cooperative use of joint-use water delivery systems to managed wetlands. Joint-use facility structures may include but are not limited to interior levees, water

conveyance ditches, water control structures, and permanent pumps. Funded activities include construction of new facilities and improvements to existing facilities.

The PAI Fund includes two programs: the 75/25 cost-share program and a 50/50 cost-share program. The 75/25 cost-share program would provide funds for infrastructure improvements that are necessary for the property to meet the 30-day flood and drain cycle objective for managed wetlands. Reimbursement of approved expenditures is limited to the purchase and installation of new, larger, lowered, or relocated discharge facilities to enable the individual owners to meet the 30-day flood and drain cycle. Funds made available by this program would not be used for regular maintenance or for fish screen construction.

The 50/50 cost-share program would provide funds for management and infrastructure improvements that are necessary to improve leaching and drainage efficiency of individual clubs. Eligible activities are cleaning, widening, deepening, and creating new primary and secondary ditches; adding v-ditches or drainage swales; raising elevations of pond bottom sinks; installing or improving interior water control structures; coring interior levees; offsetting electrical and fuel costs for portable and stationary pumps during spring leaching periods only; and offsetting fish screen electrical costs.

These funds, totaling $3.7 million, could be used for improvements as shown in Table 2-8 below.

Table 2-8. Improvements Funded by Preservation Agreement Implementation Fund

Activity Name	Applicable Fund
Clear existing interior ditches	JUFI, PAI Fund 50/50
Construct new interior ditches	JUFI, PAI Fund 50/50
Repair existing interior levees	JUFI
Core existing levees	JUFI, PAI Fund 50/50
Grade pond bottoms for water circulation and raising pond bottom sinks	JUFI, PAI Fund 50/50
Maintain pond bottom spreader V-ditches and swale	JUFI, PAI Fund 50/50
Repair existing interior water control structures	JUFI, PAI Fund 75/25, PAI Fund 50/50
Replace pipe for existing water control structures or installation of new interior water control structures	JUFI, PAI Fund 75/25, PAI Fund 50/50
Install drain pumps and platforms	JUFI, PAI Fund 75/25
Repair exterior water control structures (gates, couplers, and risers)	PAI Fund 75/25
Replace pipe for existing exterior flood or dual-purpose gate	PAI Fund 75/25
Install, repair, or reinstall water control bulkheads	PAI Fund 75/25

Protection of Other Habitat Types

The SMP is not specifically intended to restore, protect, or enhance habitats besides existing managed wetlands and properties acquired for tidal wetland restoration. However, the Principal Agencies recognize the importance of other habitats in the Marsh. As such, when properties are restored, the specific project proponent will protect sensitive habitats that may be located within the bounds of that property. In these instances, the following actions will be implemented as appropriate and feasible.

- Protect and enhance existing tidal wetlands, vernal pool, riparian, and aquatic habitat functions and values by installing fencing to enable improved grazing management.
- Maintain trees, including nonnative eucalyptus, wherever feasible, which provide limited roosting and nesting habitat for raptors, herons, egrets, and other native species in the Marsh.
- Modify and/or set back existing levees to expand the floodplain and restore natural riparian processes.
- Remove and/or modify barriers to upstream fish movement/migration within the project area.
- Plant native riparian trees and shrubs to increase habitat diversity and structure.
- Identify sources of low-DO water in sloughs and bays, and where feasible, implement strategies for increasing DO concentrations in receiving waters.
- Increase natural connectivity between the shallow high productivity marsh plain habitat and adjacent nutrient-rich channels and sloughs.

Of the restored areas, a certain portion is expected to become tidal aquatic habitat. The percent cover of tidal aquatic habitat within tidal wetlands areas (Rush Ranch, Lower Joice Island, and Hill Slough) in Suisun Marsh was estimated based on existing tidal wetlands, the Integrated Regional Wetland Monitoring Pilot Project (BREACH), and GIS and site visits. The analysis demonstrated that tidal aquatic habitat accounts for an average of approximately 5 to 15% of the total area of established tidal wetlands. Assuming this relationship holds true for future restored tidal wetlands, Table 2-9 shows the increase of tidal aquatic habitat that would be expected to result when each action alternative is fully implemented and sites develop into fully functioning tidal marshes. The increase in acreage of tidal aquatic habitat shown does not limit the amount of restoration that could occur.

Table 2-9. Increase of Tidal Aquatic Habitat in Suisun Marsh Resulting from Each Alternative

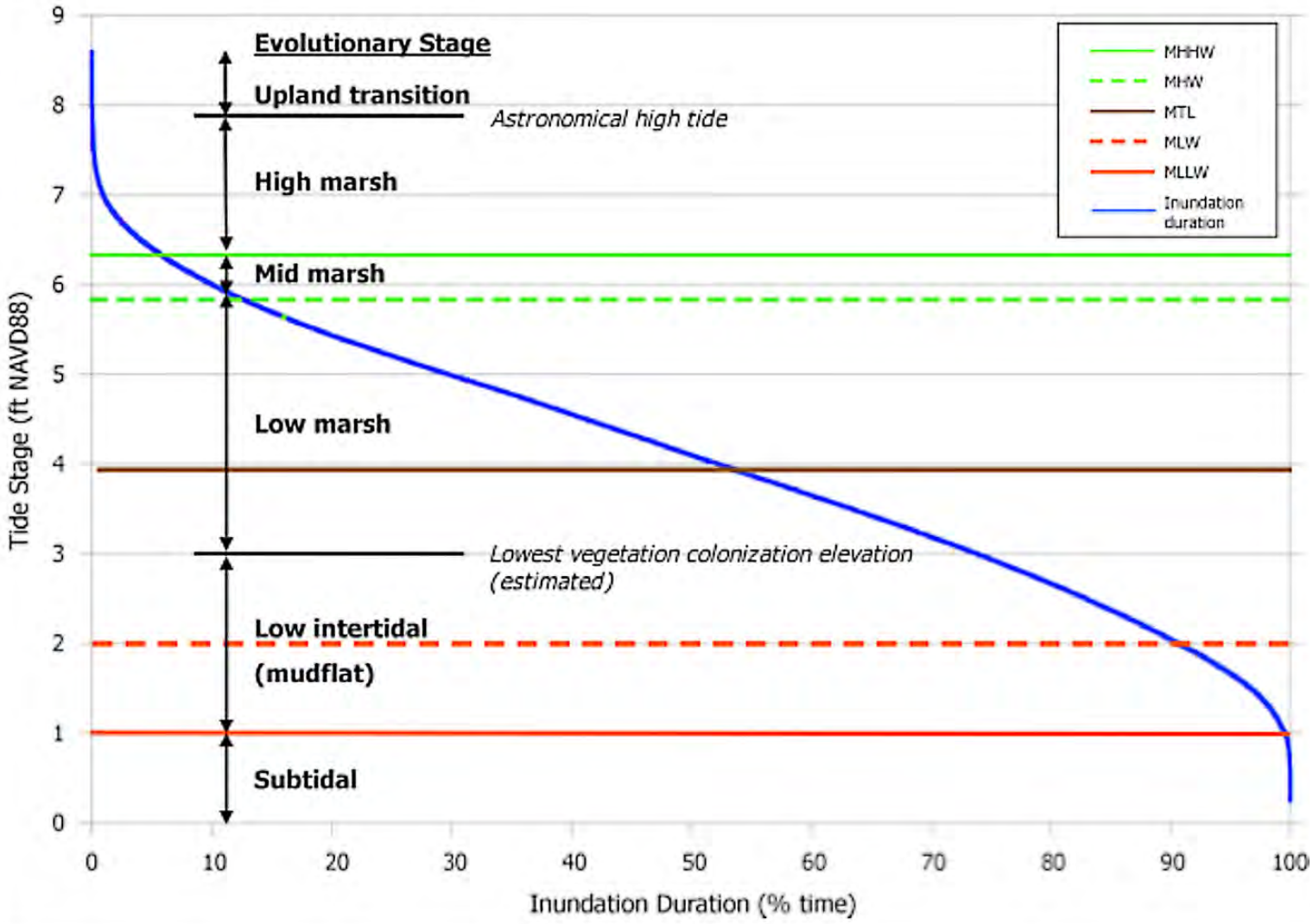
Alternative	Tidal Wetlands Restored	Tidal Aquatic Habitat Increase
Alternative A, Proposed Project	5,000–7,000	250–1050 acres
Alternative B	2,000–4,000	100–600 acres
Alternative C	7,000–9,000	350–1,350 acres

Over the 30-year SMP implementation period, it is expected that the exact habitat amount provided by restored areas will depend on the existing elevation of the site, sedimentation rates and accretion, and sea level rise. The amount of subtidal aquatic habitat is expected to decrease gradually as sediment accretes and emergent tidal vegetation is established at each restoration site. As this happens, the site will be restored to a tidal wetland. However, the rate of accretion and the rate of sea level rise will dictate the end result, and the actual timeframe for such progression depends on the site-specific conditions, but significant geomorphic changes are decadal (Figures 2-1 and 2-3). Locations with large subsidence and low sediment concentrations may never return to emergent marsh and instead remain as open water. Adaptive management also will be used to improve restoration designs to achieve desired results.

CEQA Environmentally Superior and NEPA Environmentally Preferred Alternative

According to Section 15126.6(e)(2) of the State CEQA Guidelines, if the environmentally superior alternative is the no action alternative, the EIR also must identify an environmentally superior alternative among the other alternatives. In the case of the SMP, the No Action Alternative is not environmentally superior to any of the action alternatives, and an environmentally superior action alternative need not be identified.

NEPA requires the identification of an environmentally preferred alternative. In the case of the SMP, each alternative, including the Proposed Project, has many environmental tradeoffs. For example, Alternative C includes the greatest amount of restoration, which is environmentally preferred for species that use tidal habitats. However, it also results in the greatest loss of managed wetlands, making it the least environmentally preferred for species that use these habitats. Likewise, Alternative B offers the greatest benefits for managed wetland species and the least benefits for tidal species. Alternative A, the Proposed Project, represents the mid-range of restoration intended to achieve substantial improvements in tidal wetlands in the Marsh while protecting and enhancing managed wetlands.



Source: Siegel, 2009

Graphics/Projects/project number/document (date) SS

ICF INTERNATIONAL

Figure 2-3
Inundation Regime, Marsh Elevation, and Restoration Evolution Trajectories

Suisun Marsh Plan Implementation Strategy

The SMP is predicated on the assumption that each Principal Agency will implement or approve activities in the Marsh consistent with the SMP and its own mission and jurisdictional authority. The primary components of the strategy are to:

- implement the environmental commitments and mitigation measures in this EIS/EIR and other required state and federal permit measures to ensure that resources are protected and that restoration and managed wetland goals are met simultaneously,
- implement adaptive management to ensure impacts described in this EIS/EIR are not exceeded and to improve the ecological effectiveness of restoration over the period of implementation of the SMP, and
- prepare annual reports on the status of SMP restoration and managed wetland activities.

Meeting Restoration and Managed Wetland Goals Simultaneously

The SMP would contribute to recovery of many species in the Marsh, and for this EIS/EIR, implementation of the entirety of the Proposed Project, including both the restoration activities and managed wetland activities, is an integral part of the analysis. Based on the analysis in this EIS/EIR, implementation of the Proposed Project and environmental commitments would provide sufficient tidal restoration and resource protection of fish and wildlife resources to both offset potential impacts on those resources and contribute to recovery of listed species. As such, both restoration and managed wetland activities would proceed simultaneously, and implementation will be planned to carefully monitor and mitigate the effects of SMP activities.

The managed wetland activities would be implemented only if at least one third of the total restoration activities would be implemented in each of the 10-year increments. Therefore, it is expected that under the Proposed Project, for example, 1,600–2,300 acres in the Marsh would be restored by year 10, an additional 1,600–2,300 acres would be restored by year 20, and the full 5,000–7,000 acres would be restored by year 30. This would ensure that all actions would be implemented in a timeframe similar to that of the impacts and that restoration efforts would contribute toward recovery throughout the plan implementation period. If these 10-year incremental SMP restoration goals are met, both the managed wetland activities and tidal restoration would continue to ensure that the SMP goals would be met. Options for addressing conditions in which these incremental goals are not met are described below. Under this strategy, the restoration and managed wetland goals would be achieved concurrently. How the restoration acres would be applied for purposes of other

regulatory permitting requirements (i.e., recovery vs. mitigation) would be specified through each permit as applicable.

Applying Adaptive Management

Many questions remain as to how proposed actions may result in changes in habitat functions and values. To ensure that impacts do not exceed those described in this EIS/EIR and to improve the ecological effectiveness of restoration projects as they are implemented, an Adaptive Management Plan (AMP) will be implemented as a crucial component of the SMP.

Adaptive management of the SMP will consist of an iterative process of:

1. implementing actions that apply the understandings and test hypotheses contained in the conceptual models;
2. collecting science-based field data at implementation areas and in any needed other locations that specifically evaluate the hypotheses being tested;
3. interpreting these data;
4. reevaluating goals and objectives, as appropriate, updating conceptual models and hypotheses, and adjusting subsequent implementation actions; and
5. reviewing the progress of restoration and managed wetland enhancement to determine if changes in the adaptive management plan are necessary.

This process allows for implementing tidal marsh restoration in the face of uncertainty, with an aim to reducing uncertainty over time through system monitoring. In this way, decision making simultaneously meets resource objectives and accrues information needed to improve future management. The information produced through adaptive management of the SMP will permit changes to be made that will assist in the design of future steps. Adaptive management will assist project proponents in understanding the restored system and will aid in their ability to explain their management actions to Suisun Marsh neighbors and the general public. As such, the AMP is an important component of the implementation strategy and will be used throughout the 30-year implementation period. Adaptive management of implementing the SMP will be conducted consistent with available funding.

Reporting

To track the progress of restoration and managed wetland activities, the SMPA agencies (Reclamation, SRCD, DWR, and DFG) would submit implementation status reports annually to DFG, NMFS, and USFWS and other regulatory agencies that would describe the implemented restoration and managed wetland activities. Additional activities, including monitoring, application of adaptive

management, results of adaptive management, and any activities that are being planned, would be submitted no less frequently than every other year.

The SMPA agencies will report the status of restoration and managed wetlands in each report. Additional information will be included in the SMP Biological Assessments and Biological Opinions. In general, reports will include the following information:

- the location, extent, and timing of land acquisition for tidal restoration;
- the location, extent, and timing of restoration planning, protection, enhancement, restoration, or creation of tidal wetlands;
- status of restoration planning for acquired properties;
- descriptions of conservation agreements, lands acquired in fee title, interagency memorandums of agreement, or any other agreements entered into for the purposes of protecting, enhancing, or restoring tidal or managed wetlands;
- descriptions of the previous year's managed wetland activities, including a description of how actual impacts compare to impacts analyzed in this EIS/EIR (this information can be used to determine if additional CEQA or NEPA documentation is required for future discretionary actions);
- descriptions of monitoring results, including any actions that will be implemented as a result of this information; and
- a summary of how implemented activities compare to SMP goals in terms of habitat types, managed wetland operations, acreage goals, and species composition.

If any report indicates that restoration or managed wetland targets are not being met or have the potential not to be met, the SMPA agencies along with NMFS and USFWS will convene to determine how to proceed to get plan implementation on track. The mutually agreeable plan of action may include a range of potential solutions, including:

- changes to the manner in which the SMP is implemented,
- temporarily or permanently adjusting certain SMP provisions through an amendment or other process, or
- slowing or stopping aspects of the managed wetland activities permit issuance until restoration catches up with impacts.

Project-Specific Implementation

The SMP likely would rely on several restoration actions to meet the restoration goals. Some sites have been identified as available for restoration (e.g., Meins Landing, Hill Slough), and other properties that have the characteristics desired for restoration are anticipated to become available for purchase (see Table 2-2).

The SMP attempts to describe a typical restoration action in an effort to fully describe the potential impacts of the restoration element of the SMP because this EIS/EIR is intended to provide as much environmental analysis as possible with the limited site-specific information relative to the 30-year plan implementation. In some site-specific instances, the project proponent will be able to rely solely on this EIS/EIR for CEQA and/or NEPA compliance, and under other circumstances, this EIS/EIR may be tiered from or supplemented to disclose all potential environmental impacts. The approach for each restoration action will be determined by the specific lead agencies and will be based on this EIS/EIR, project-specific design components, consideration of any new information (including that obtained through implementation of the AMP), or other factors.

The managed wetland activities would be implemented by the SMPA Agencies, including SRCD, which represents private landowners and reclamation districts in the Marsh, as described for each activity, and this EIS/EIR discloses all of the resulting potential impacts. As such, additional CEQA and/or NEPA documentation is not expected to be required over the 30-year plan implementation period for the management activities.

Plan Response to Predicted Sea Level Rise

This EIS/EIR evaluates the long-term alternatives for the SMP over a 30-year planning horizon, including consideration of global climate change and relative sea level rise on habitat distributions, ability to support target ecological functions, and flood hazards. Relative sea level rise—or the rate of sea level rise expected to be observed locally—is a product of global sea level rise, tectonic land movements, and local subsidence and sedimentation. The rate of global sea level rise is expected to continue along a global warming–induced trajectory, and model-based predictions of sea level rise range from low estimates of 0.18 to 0.38 meter and high estimates of 0.26 to 0.59 meter by the end of the 21st century (Intergovernmental Panel on Climate Change 2007). A regional study estimates that the sea level will increase in California between 12 and 17 inches (0.3 to 0.4 meter) by 2050 and between 20 and 55 inches (0.5 to 1.4 meters) by 2099 (San Francisco Bay Conservation and Development Commission 2009). More recent Ocean Protection Council (OPC) estimates are also consistent with these estimates (Vermeer and Rahmstorf 2009). Although significant uncertainty exists regarding these rates, ongoing research regarding the primary factors affecting global and regional sea level rise continues to narrow the uncertainties and refine future estimates.

Looking forward, if sea level rise matches the mid-range of the Intergovernmental Panel on Climate Change (IPCC) (2007) predictions and sediment availability to the Marsh remains the same, sustainable vegetated tidal marshes are expected to develop in the tidally restored ponds within the plan's 30-year planning horizon. If higher rates of sea level rise prevail, tidally restored areas within the SMP area may persist as intertidal unvegetated mudflats or shallow–open water habitat for prolonged periods. Many tidally restored

wetlands still would be expected to accrete sediment and eventually support vegetated tidal marsh, except at a slower rate, though some restorations in Suisun could remain unvegetated well into the foreseeable future.

Higher than anticipated sea level–rise rates that result in delayed or arrested marsh establishment could hinder the progression toward tidal wetlands, resulting in a mix of habitats, including managed wetlands, tidal wetlands, open water, and subtidal aquatic habitats. Sea level rise represents only one of many uncertainties that could affect the ultimate habitat mix.

A number of features can be built into the restoration efforts to support achieving long-term ecological functions. Providing for the tidal wetland to advance "upslope" can be achieved through constructing a gradually sloping wetland/upland transition zone at interior sites and selecting restoration sites at the wetland-upland edge of Suisun that provide an elevation gradient over which tidal wetland could shift upslope as sea level rises. Promoting early emergent vegetation can help to capture sediment for marsh accretion, and it can enhance the accumulation of organic matter in the developing wetland sediments. This could be accomplished by managing lands prior to restoring tidal action to promote wetland plant biomass accumulation that reverses subsidence.

The potential for sea level rise is acknowledged in the site selection considerations and therefore will be a recurring consideration based on best available science for each restoration project. Administration of this criterion will recognize the dynamic nature of the land/water interactions, including subsidence, sediment accretion potential, and biomass accumulation potential. This will enable project designs to be based on habitat trajectory (as opposed to current or static conditions) over the 30-year planning horizon. This approach will help minimize "sunk cost" of habitat and facility investments as well as help ensure that the targeted habitat type occurs as planned. In addition to site selection and project design considerations, the AMP provides a framework for adapting to sea level rise.

Managed wetland operations and levee maintenance would be adjusted over time with sea level rise. Flood protection levees would be designed to accommodate future sea level rise, either with higher crown elevations at the time of initial construction or with the flexibility to add levee height in the future. Ongoing levee maintenance would maintain levee crown elevations as needed to provide continued flood protection with sea level rise. In general, raising levee crown heights requires widening the levee footprint in order to maintain levee stability. Managed wetlands also will be more difficult to drain by gravity at low tide, thereby reducing water management ability, which can be offset mainly through increased use of pumps for managed wetland drainage, with some clubs continuing to be gravity-drained but with greater management options to take best advantage of every low tide.

Environmental Commitments

As part of the plan implementation, individual project proponents will incorporate certain environmental commitments and BMPs into specific projects to avoid or minimize potential impacts as applicable. Project proponents and the appropriate agencies also will coordinate planning, engineering, and design phases of the project. The environmental commitments are divided between Restoration Activities and Managed Wetland Activities. For restoration activities, project proponents are defined as any state, federal or local agency, landowner, or implementing body of a restoration action. For managed wetland activities, the SMPA Agencies (SRCD, DFG, DWR, and/or Reclamation) are the project proponents and will be responsible for implementing the environmental commitments, depending on the activity (Table 1-1).

Restoration Environmental Commitments

The following BMPs and environmental commitments will be implemented during restoration activities. The environmental commitments discussed below apply to the activities described in the Restore Tidal Wetlands section above.

Standard Design Features and Construction Practices

USFWS, Reclamation, and DFG, as lead agencies for the SMP, determined the following design features and construction practices to be potentially feasible and implementable measures to reduce or mitigate certain short-term, construction-related effects. These measures would be implemented at a site-specific level, as appropriate, depending on the location of construction, potential effects of the specific project, and surrounding land uses. The identified measures are:

- Stopping work immediately if a conflict with a utility facility occurs and contacting the affected utility to (1) notify it of the conflict, (2) aid in coordinating repairs to the utility, and (3) coordinate to avoid additional conflicts in the field.
- Constructing structures in accordance with California Building Code and County General Plan Standards to resist seismic effects and to meet the implementation standards outlined in the Solano County General Plan.
- Ensuring that changes within the Suisun Marsh channels will not significantly affect navigation and emergency access by having Rio Vista and Vallejo Coast Guard Stations review plans to assess safety issues associated with changes when there is potential for in-channel work to affect access.
- Implementing BMPs to minimize any disease-carrying mosquitoes and threats to public health if it is found that project components pose a threat to public health.

- Controlling construction equipment access and placement of fill to maintain acceptable loading based on the shear strength of the foundation material.
- Minimizing degradation of wetland habitats where feasible, i.e., work will be conducted from levee crown.
- Implementing BMPs and measures to minimize water quality impacts such as temporary turbidity increases. See Erosion and Sediment Control Plan below.
- Inspecting all equipment for oil and fuel leaks every day prior to use. Equipment with oil or fuel leaks will not be used within 100 feet of wetlands.
- Requiring the construction contractor to remove all trash and construction debris after construction and to implement a revegetation plan for temporarily disturbed vegetation in the construction zones.
- Maintaining waste facilities. Waste facilities include concrete wash-out facilities, chemical toilets, and hydraulic fluid containers. Waste will be removed to a proper disposal site.

Access Point/Staging Areas

Project proponents will establish staging areas for equipment storage and maintenance, construction materials, fuels, lubricants, solvents, and other possible contaminants in coordination with resource agencies. Practices and procedures for construction activities along city and county streets will be consistent with the policies of the affected local jurisdiction.

Staging areas will have a stabilized entrance and exit and will be located at least 100 feet from bodies of water unless site-specific circumstances do not allow such a setback, in which case the maximum setback possible will be used. If an off-road site is chosen, qualified biological and cultural resources personnel will survey the selected site to verify that no sensitive resources would be disturbed by staging activities. If sensitive resources are found, an appropriate buffer zone will be staked and flagged to avoid impacts. If impacts on sensitive resources cannot be avoided, the site will not be used. An alternate site will be selected.

Where possible, no equipment refueling or fuel storage will take place within 100 feet of a body of water. Vehicle traffic will be confined to existing roads and the proposed access route. Ingress and egress points will be clearly identified in the field using orange construction fence. Work will not be conducted outside the designated work area.

Erosion and Sediment Control Plan

For projects that could result in substantial erosion, project proponents will prepare and implement an erosion and sediment control plan to control short-term and long-term erosion and sedimentation effects and to restore soils and

vegetation in areas affected by construction activities. The plan will include all the necessary local jurisdiction requirements regarding erosion control and will implement BMPs for erosion and sediment control as required.

An erosion control plan will be developed to ensure that during rain events construction activities do not increase the levels of erosion and sedimentation. This plan will include the use of erosion control materials (baffles, fiber rolls, or hay bales; temporary containment berms) and erosion control measures such as straw application or hydroseeding with native grasses on disturbed slopes, and floating sediment booms and/or curtains to minimize any impacts that may occur from increased mobilization of sediments.

Stormwater Pollution Prevention Plan

For projects that involve grading or disturbance of more than 1 acre, a stormwater pollution prevention plan (SWPPP) will be developed by a qualified engineer or erosion control specialist and implemented prior to construction. The objectives of the SWPPP would be to (1) identify pollutant sources associated with construction activity and project operations that may affect the quality of stormwater and (2) identify, construct, and implement stormwater pollution prevention measures to reduce pollutants in stormwater discharges during and after construction. The project proponents and/or their contractor(s) will develop and implement a spill prevention and control plan as part of the SWPPP to minimize effects from spills of hazardous, toxic, or petroleum substances during construction of the project. Implementation of this measure would comply with state and federal water quality regulations. The SWPPP will be kept on site during construction activity and during operation of the project and will be made available upon request to representatives of the RWQCB. The SWPPP will include but is not limited to:

- a description of potential pollutants to stormwater from erosion,
- management of dredged sediments and hazardous materials present on site during construction (including vehicle and equipment fuels),
- details of how the sediment and erosion control practices comply with state and federal water quality regulations, and
- a description of potential pollutants to stormwater resulting from operation of the project.

Noise Compliance

The project proponents and/or their contractors will comply with local noise regulations when construction activities occur near residences by limiting construction to the hours specified by Solano County. It is assumed that construction activities would occur during normal working hours, between

7:00 a.m. and 6:00 p.m., Monday through Friday, and between 8:00 a.m. and 5:00 p.m., Saturday and Sunday.

Additionally, when it is determined through site-specific analysis that construction has the potential to occur near residences, noise-reduction practices listed below will be implemented.

1. Use electrically powered equipment instead of internal combustion equipment where feasible.
2. Locate staging and stockpile areas and supply and construction vehicle routes as far away from sensitive receptors as possible.
3. Establish and enforce construction site and haul road speed limits.
4. Restrict the use of bells, whistles, alarms, and horns to safety warning purposes.
5. Design equipment to conform to local noise standards.
6. Locate equipment as far from sensitive receptors as possible.
7. Equip all construction vehicles and equipment with appropriate mufflers and air inlet silencers.
8. Restrict hours of construction to periods permitted by local ordinances.
9. Locate redirected roadways away from sensitive receptors.

Traffic and Navigation Control Plan and Emergency Access Plan

For projects that would substantially affect traffic or navigation patterns, or could result in hazardous road or waterway conditions, the project proponents, in coordination with affected jurisdictions, will develop and implement a traffic and navigation control plan, which will include an emergency access plan to reduce construction-related effects on the local roadway and waterway systems and to avoid hazardous traffic and circulation patterns during the construction period. All construction activities will follow the standard construction specifications and procedures of the appropriate jurisdictions, and will avoid major construction activities on days known or expected to have a significant increase in traffic as a result of events in the Marsh.

The traffic and navigation control plan will include an emergency access plan that provides for access into and adjacent to the construction zone for emergency vehicles. The emergency access plan, which requires coordination with emergency service providers such as the Coast Guard before construction, would require effective traffic and navigation direction, substantially reducing the potential for disruptions to response routes.

The traffic and navigation control plan will include but not be limited to the following actions, depending on site-specific conditions:

- coordinating with the affected jurisdictions on construction hours of operation;
- following guidelines of the local jurisdiction for road closures caused by construction activities;
- installing traffic control devices as specified in the California Department of Transportation's (Caltrans's) *Manual of Traffic Controls for Construction and Maintenance Works Zones* (2004);
- notifying the public of road closures in the immediate vicinity of the open trenches in the construction zone and of temporary closures of recreation trails;
- posting signs that conform to the California Uniform State Waterway Marking System upstream and downstream of the dredge areas to warn boaters of work;
- providing access to driveways and private roads outside the immediate construction zone;
- coordinating with Solano County to monitor and repair road damage to levee roads and any other roads damaged during construction to the extent allowed by law, depending on the specific project proponent. An MOU may be implemented for specific restoration projects and could include the following as suggested by Solano County:
  - The restoration project will be responsible for the cost of maintaining, repairing, paving and/or reconstructing roads affected during construction, operation, and maintenance of the restoration project.
  - Repairs will be implemented to comply with the current County Road Improvement Standards, except that repairs to damaged paved sections may be made within 5 inches of asphalt concrete at the discretion of the County, while repairs to damaged gravel sections of road will replace the preexisting depth of aggregate base but not less than 12 inches in depth;
- coordinating with the Union Pacific Railroad prior to beginning any work within the right-of-way of a rail line to ensure that the integrity of the rail line is maintained and to minimize disruptions to service; and
- coordinating with emergency service providers before construction to develop an emergency access plan for emergency vehicles into and adjacent to the construction zone; the emergency access plan would require effective traffic direction, substantially reducing the potential for disruptions to response routes.

Recreation Best Management Practices

The project proponents will implement measures related to recreation and recreation facilities to decrease impacts.

- Avoid nesting habitats and other sensitive areas, such as important roosting and foraging sites during critical nesting periods.

Temporary impacts on boating access may be minimized by:

- not allowing construction to occur during major summer holiday periods;
- maintaining boat access to prime areas;
- providing public information regarding alternate access;
- posting warning signs and buoys in channels, upstream of and downstream of all construction equipment, sites, and activities, during construction;
- posting signs describing alternate boating routes in convenient locations when boating access is restricted; and
- minimizing water-level fluctuation during construction.

Mosquito Abatement Best Management Practices

As described in Section 7.8, Public Health and Environmental Hazards, the Solano County Mosquito Abatement District (SCMAD) is concerned that tidal restoration has the potential to increase mosquito production in the Marsh. However, tidal restoration would be designed to minimize such effects. To further reduce the potential for this effect to occur, SCMAD has recommended several measures to reduce the potential for the production and subsequent spread of diseases carried by mosquitoes. Specific project proponents would develop site-specific plans to address mosquito production for each restoration activity based on the following recommendations, which would be implemented prior to removal or breaching of any levee or water control structure:

1. Develop a management program consistent with Marsh-wide management actions for the control of mosquitoes.
2. If necessary, obtain an engineering survey to locate depressions that would retain tidal water and design site restoration to promote water drainage.

Hazardous Materials Management Plan

A hazardous materials spill plan will be developed prior to construction of each action. The plan will describe the actions that will be taken in the event of a spill. The plan also will incorporate preventive measures to be implemented (such as vehicle and equipment staging, cleaning, maintenance, and refueling) and contaminant (including fuel) management and storage. In the event of a contaminant spill, work at the site immediately will cease until the contractor has contained and mitigated the spill. The contractor will immediately prevent further contamination, notify appropriate authorities, and mitigate damage as appropriate. Adequate spill containment materials, such as oil diapers and hydrocarbon cleanup kits, will be available on site at all times. Containers for

storage, transportation, and disposal of contaminated absorbent materials will be provided on the project site.

The project proponents and their contractors will not use any hazardous material in excess of reportable quantities, as specified in Title 40 CFR Part 355, Subpart J, Section 355.50, unless approved in advance by the Office of Emergency Services (OES), and will provide to the OES in the annual compliance report a list of hazardous materials contained at a project site in reportable quantities. The reporting of Hazardous Materials in excess of reportable quantities of Title 40 CFR Part 355 is required annually to Solano County Environmental Health Services Division as the Solano County Certified Unified Program Agency (CUPA).

For large-scale projects, the project proponents will prepare a risk management plan (RMP). The RMP will be submitted to EPA and will reflect the comments of the Solano County CUPA. An RMP addresses acutely hazardous materials such as chlorine gas, ammonia gas, hydrogen chloride, flammable gases. This document is required to be submitted to both the EPA and Solano County Environmental Health Services Division as the CUPA. The plan will describe procedures, protective equipment requirements, and training and contain a checklist. At least 60 days prior to the start of construction, or a lesser period of time as mutually agreed upon, the project proponents will provide the final RMP and the safety plan to the Certified Property Manager (CPM).

Air Quality Best Management Practices

The following control practices will be used to offset any air quality issues that may arise (Bay Area Air Quality Management District 1999).

Basic Control Measures

The following controls will be implemented at all construction sites.

- Treat all graded surfaces to prevent nuisances from dust or spillage on roads or adjacent properties.

Enhanced Control Measures

The following measures will be implemented at construction sites greater than 4 acres in area.

- Hydroseed with native or non-invasive species appropriate to that specific location or apply (nontoxic) soil stabilizers to inactive construction areas (i.e., previously graded areas inactive for 10 days or more).
- Limit traffic speeds on unpaved roads to 15 mph.

- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- Replant vegetation with native or non-invasive species appropriate to that specific location in disturbed areas as quickly as possible.

Additional Air Quality Best Management Practices

In addition to the above BMPs, the following measures will be required in order to further reduce construction emissions:

- maintain properly tuned engines;
- minimize the idling time of diesel-powered construction equipment to 2 minutes;
- use alternative-powered (e.g., hybrid, compressed natural gas, biodiesel, electric) construction equipment;
- use add-on control devices such as diesel oxidation catalysts or particulate filters; and
- require all contractors to use equipment that meets California Air Resources Board's (ARB's) most recent certification standard for off-road heavy-duty diesel engines.

Visual/Aesthetic Best Management Practices

For projects that have the potential to affect views or create a new source of light or glare, project proponents will identify sensitive view receptors for site-specific analysis and ensure that contractors minimize fugitive light from portable sources used for nighttime operations. Also, a visual barrier will be installed to prevent light spill from truck headlights in areas with sensitive view receptors.

Inadvertent Discovery of Cultural Resources

Federal and state laws and regulations outline the courses of action required in the event of inadvertent discoveries of cultural resources, including human remains. Section 106 of the National Historic Preservation Act (NHPA) allows for federal agencies to plan for post-Section 106 review, or inadvertent, discoveries of cultural resources prior to authorization of a federal action or undertaking (36 CFR 800.13[a]). One avenue for planning is through a programmatic agreement (PA) (see 36 CFR 800.13[a][2]). Such PAs must define the parties responsible for action in the event of cultural resource discoveries, communication protocols, response times, and specific action items. The cultural resources analysis in this EIS/EIR identifies a PA as a critical element in mitigating significant effects on cultural resources; the PA will include provisions for inadvertent discoveries.

Federal and state laws and regulations impose additional requirements specific to the discovery of human remains and associated artifacts. On federal or tribal land, human remains discoveries are subject to the Native American Grave Protection and Repatriation Act (NAGPRA). Additionally, Reclamation has specific policies for the implementation of the NAGPRA provisions (Reclamation Directives and Standards LND 07-01). For human remains discoveries on non-federal land, the requirements of the California Public Resources Code and Health and Safety Code apply, as described below. In the event that human remains are discovered inadvertently during ground-disturbing activities, the lead state or federal agency will implement the following measures. These measures also will be discussed, with explicit treatment of roles and responsibilities under the various applicable regulations, in the PA referenced previously.

- The contractor immediately will cease work within 100 feet of the find. All construction personnel will leave the area. Vehicles and equipment will be left in place until a qualified archaeologist identifies a safe path out of the area. The on-site supervisor will flag or otherwise mark the location of the find and keep all traffic away from the resource. The on-site supervisor immediately will notify the lead state or federal agency of the find.
- The lead federal agency is responsible for compliance with NAGPRA (43 CFR 10) if inadvertent discovery of Native American remains occurs on federal lands. The lead federal agency is responsible for compliance with state laws relating to the disposition of Native American burials (Public Resources Code [PRC] 5097 and California Health and Safety Code 7050.5[b]) for human remains discoveries on non-federal lands.
- If human remains of Native American origin are discovered during ground-disturbing activities on non-federal land, the lead state or federal agency must comply with state laws relating to the disposition of Native American burials, which fall within the jurisdiction of the Native American Heritage Commission (NAHC) (PRC 5097). If human remains are discovered or recognized in any location other than a dedicated cemetery, the lead state or federal agency will not allow further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:
  - the Solano County coroner has been informed and has determined that no investigation of the cause of death is required; and
  - if the remains are of Native American origin,
    - the descendants of the deceased Native Americans have made a recommendation to the landowner or the person responsible for the excavation work for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in PRC 5097.98; or
    - the NAHC was unable to identify a descendant or the descendant failed to make a recommendation within 48 hours after being notified by the NAHC.

Biological Resources Best Management Practices

The following section outlines the potential BMPs that would be implemented to avoid or minimize impacts on biological resources. The BMPs that are implemented for each specific project will depend on the project location, potential to adversely affect biological resources, and guidance and requirements set forth by resource agencies through informal and formal consultations. Environmental commitments, including an erosion and sediment control plan, SWPPP, hazardous materials management plan, spoils disposal plan, and environmental training content will be provided to NMFS, USFWS, and DFG 30 days prior to construction activities commencing at a restoration site. Any adverse effects on special-status species, critical habitat, or essential fish habitat (EFH) attributable to construction activities may require implementation of additional avoidance or mitigation measures. NMFS, USFWS, and DFG will be consulted, and additional avoidance and mitigation measures may be implemented on a site-specific basis.

General Best Management Practices

- No firearms (except for federal, state, or local law enforcement officers and security personnel) will be permitted at the project site to avoid harassment, killing, or injuring of wildlife.
- No pets will be permitted at the project site to avoid harassment, killing, or injuring of wildlife.
- Native vegetation trimmed or removed on the project site will be stockpiled during work. After construction activities, removal of temporary mats and construction-related materials, and application of native seed mix have been completed, stockpiled native vegetation will be reapplied over temporarily disturbed wetlands to provide temporary soil protection and as a seed source.
- Where vegetation removal is required, work will be conducted using hand-held tools to enable wildlife to escape. If any areas with pickleweed or vegetation within 50 feet of the edge of pickleweed need to be cleared for project activities, vegetation shall be removed only with non-mechanized hand tools (i.e., trowel, hoe, rake, and shovel). No motorized equipment, including weed whackers and lawn mowers, shall be used to remove this vegetation. Vegetation shall be removed under the supervision of a qualified biologist approved by DFG and USFWS. If a mouse of any species is observed within the areas being removed of vegetation, DFG and USFWS shall be notified. Vegetation removal may begin when no mice are observed and shall start at the edge farthest from the salt marsh or the poorest habitat and work its way toward the salt marsh or the better salt marsh habitat.
- Removal of vegetation in wetland habitat will be conducted with a qualified biological monitor present. This monitor will watch for special-status wildlife species and temporarily stop work if special-status species are encountered. Wildlife will be allowed to escape before work is resumed. Monitors with the appropriate qualifications to handle special-status species

will be allowed to move special-status species to safe locations as permitted by their authorizations.

- Temporarily affected wetlands will be restored by removing construction-related debris, and trash. Affected areas will be seeded with a seed mix of local native wetland species.

Worker Training

Project proponents will provide training to field management and construction personnel on the importance of protecting environmental resources. Communication efforts and training will be done during preconstruction meetings so that construction personnel are aware of their responsibilities and the importance of compliance.

Construction personnel will be educated on the types of sensitive resources located in the project area and the measures required to avoid impacts on these resources. Materials covered in the training program will include environmental rules and regulations for the specific project and requirements for limiting activities to the construction right-of-way and avoiding demarcated sensitive resources areas. Training seminars will educate construction supervisors and managers on:

- the need for resource avoidance and protection,
- construction drawing format and interpretation,
- staking methods to protect resources,
- the construction process,
- roles and responsibilities,
- project management structure and contacts,
- environmental commitments, and
- emergency procedures.

If new construction personnel are added to the project, the contractor will ensure that the personnel receive the mandatory training before starting work. A representative will be appointed during the employee education program to be the contact for any employee or contractor who might inadvertently kill or injure a listed species or who finds a dead, injured, or entrapped individual. The representative's name and telephone number will be provided to the USFWS before the initiation of ground disturbance.

Special-Status Plant Species Protection

A complete botanical survey of restoration areas will be completed using the USFWS's *Guidelines for Conducting and Reporting Botanical Inventories for*

Federally Listed, Proposed and Candidate Plants (September 23, 1996) (U.S. Fish and Wildlife Service 1996a) and DFG's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (November 24, 2009) (California Department of Fish and Game 2009).

- Special-status plant surveys required for project-specific permit compliance will be conducted within 1 year prior to initiating construction. The purpose of these surveys will be to verify that the locations of special-status plants identified in previous surveys are extant, identify any new special-status plant occurrences, and cover any portions of the project area not previously identified. The extent of mitigation of direct loss of or indirect impacts on special-status plants will be based on these survey results.
- Locations of special-status plants in proposed construction areas will be recorded using a global positioning system (GPS) unit and flagged.
- If initial screening by a qualified biologist identifies the potential for special-status plant species to be directly or indirectly affected by a specific project, the biologist will establish an adequate buffer area to exclude activities that would directly remove or alter the habitat of an identified special-status plant population or result in indirect adverse effects on the species.
- Access may be restricted around restoration sites where necessary to protect special-status plant populations though appropriate management plans and the design of the tidal marsh restoration. This may include signage, buffers, seasonal restrictions and design or no access depending on the sensitive species in question.
- The project proponents will oversee installation of a temporary, plastic mesh–type construction fence (Tensor Polygrid or equivalent) at least 1.2 meters (4 feet) tall around any established buffer areas to prevent encroachment by construction vehicles and personnel. A qualified biologist will determine the exact location of the fencing. The fencing will be strung tightly on posts set at maximum intervals of 3 meters (10 feet) and will be checked and maintained weekly until all construction is complete. The buffer zone established by the fencing will be marked by a sign stating:

  > This is habitat of *[the special-status species being protected],* a *[identify the species' status]* plant species, and must not be disturbed. This species is protected by *[the Endangered Species Act of 1973, as amended/California Endangered Species Act/California Native Plant Protection Act]*. Violators are subject to prosecution, fines, and imprisonment.

- No construction activity, including grading, will be allowed until this condition is satisfied.
- No grading, clearing, storage of equipment or machinery, or other disturbance or activity will occur until all temporary construction fencing has been inspected and approved by the qualified biologist.
- Where feasible, for stump-sprouting vegetation, construction will limit removal of woody vegetation by trimming vegetation to approximately 1 foot above ground level.

Protection of Special-Status Wildlife Species

If individuals of listed wildlife species may be present and subject to potential injury or mortality from construction activities, a qualified biologist will conduct a preconstruction survey. Minimum qualifications for the qualified biologist will be a 4-year college degree in biology or related field and 2 years of professional experience in the application of standard survey, capture, and handling methods for the species of concern. However, in the case of fully protected species, no capture or handling will be done. Fully protected wildlife species are listed in Section 6.3, Wildlife. Any special-status mammal, bird or other species observed during surveys will be reported to DFG so the observations can be added to the California Natural Diversity Database (CNDDB).

Mammals

Only two special-status mammal species occur in the Marsh, salt marsh harvest mouse and Suisun shrew. Suisun shrews use habitat similar to salt marsh harvest mouse, so any measures implemented to protect salt marsh harvest mouse would apply to shrews. The following measures will be implemented:

- A USFWS-approved biologist, with previous salt marsh harvest mouse monitoring and surveying experience, will identify suitable salt marsh habitat for the mouse prior to project initiation.
- Disturbance to wetland vegetation will be avoided to the extent feasible in order to reduce potential impacts on salt marsh harvest mouse habitat. If wetland vegetation cannot be avoided, it will be removed by hand. The USFWS-approved biologist will be on site to monitor all wetland vegetation removal activities.
- The upper 6 inches of soil excavated within salt marsh harvest mouse habitat will be stockpiled separately and replaced on top of the backfilled material.
- Vegetation will be removed by hand using hand tools.
- In construction and staging areas where habitat is to be disturbed, vegetation must be cleared to bare ground or stubble no higher than 1 inch.
- Work will be scheduled to avoid extreme high tides (6.5 feet or above, as measured at the Golden Gate Bridge) when there is potential for salt marsh harvest mouse to move to higher, drier grounds. All equipment will be staged on existing roadways away from the project site when not in use.
- To prevent salt marsh harvest mouse from moving through the project site during construction, temporary exclusion fencing will be placed around a defined work area before construction activities start and immediately after vegetation removal. The fence should be made of a material that does not allow salt marsh harvest mouse to pass through or over, and the bottom should be buried to a depth of 2 inches so that mice cannot crawl under the fence. Any supports for the salt marsh harvest mouse exclusion fencing must be placed on the inside of the project area.
- Prior to the start of daily construction activities during initial ground disturbance, the USFWS-approved biological monitor will inspect the salt

marsh harvest mouse–proof boundary fence to ensure that it has no holes or rips and the base is still buried. The fenced area also will be inspected to ensure that no mice are trapped in it. Any mice found along and outside the fence will be closely monitored until they move away from the construction area.

- If a salt marsh harvest mouse is discovered, construction activities will cease in the immediate vicinity of the individual until DFG and USFWS are contacted and the individual has been allowed to leave the construction area.
- A DFG- and USFWS-approved biologist with previous salt marsh harvest mouse experience will be on site during construction activities occurring in wetlands. The biologist will document compliance with the project permit conditions and avoidance and conservation measures. The biologist has the authority to stop project activities if any of the requirements associated with these measures is not being fulfilled. If the biologist has requested work stoppage because of take of any of the listed species, the USFWS and DFG will be notified within 1 day by email or telephone.

Birds

The project proponents will perform preconstruction surveys to determine whether nesting birds, including migratory birds, raptors, and special-status bird species, are present within or immediately adjacent to the project sites and associated staging and storage areas if activities would occur during active nesting periods. Bird species using the managed wetland habitat include waterfowl, shorebirds, Suisun song sparrow, Suisun common yellowthroat, and several other resident and migratory songbirds.

- The project proponents will remove all woody and herbaceous vegetation from construction areas (earthwork areas) during the nonbreeding season (September 1–February 1) to minimize effects on nesting birds.
- During the breeding season, all vegetation subject to impact will be maintained to a height of approximately 6 inches to minimize the potential for nesting.
- If construction occurs during the breeding season and not all affected vegetation has been removed, a qualified biologist will survey the construction area for active nests and young migratory birds immediately before construction.
- If active nests or migratory birds are found within the boundaries of the construction area, the project proponents will develop appropriate measures and coordinate with DFG to determine an acceptable buffer width.
- Inactive migratory bird nests (excluding raptors) located outside of the construction areas will be preserved. If an inactive migratory bird nest is located in the area of effect, it will be removed before the start of the breeding season (approximately February 1).
- Impacts on great blue heron rookeries will be avoided; mature trees will not be removed and nearby work will occur outside the nesting season.

Raptors

- Preconstruction surveys will be performed before and during the raptor nesting season (bimonthly, i.e., two times per month) to identify existing nests that may be used during the nesting season.
- Raptors may nest from later winter through mid-summer; therefore, multiple nesting season surveys will performed.
- DFG will be notified of all raptor nests located during the preconstruction surveys. If a raptor nest is located within the recommended buffer, the project proponents will coordinate with DFG to determine an acceptable buffer width.
- If an active raptor nest is found outside the construction areas, a buffer zone will be created around the nest tree. For special-status species a larger buffer will be required (e.g., 0.5-mile Swainson's hawk buffer). The project proponents will coordinate with DFG prior to project implementation to determine the species-specific buffer widths.

California Clapper Rail and California Black Rail

If construction activities are necessary during the breeding season, preconstruction surveys for California clapper rail and black rail will be conducted at and adjacent to areas of potential tidal and managed wetlands habitats for California clapper rail and black rail. The surveys will focus on potential habitat that may be disturbed by construction activities during the breeding season to ensure that these species are not nesting in these locations. Survey methods will follow the protocols used by DFG during previous rail surveys in Suisun Marsh (California Department of Fish and Game 2007). The specific project proponent will implement the following survey protocols:

- Surveys should be initiated sometime between January 15 and February 1. A minimum of four surveys should be conducted. The survey dates should be spaced at least 2 to 3 weeks apart and should cover the time period from the date of the first survey through the end of March or mid-April. This will allow the surveys to encompass the time period when the highest frequency of calls is likely to occur.
- Listening stations will be established at 150-meter intervals along road, trails, and levees that will be affected by plan implementation.
- California clapper rail and California black rail vocalization recordings will be played at each station.
- For California clapper rails, each listening station will be occupied for a period of 10 minutes, followed by 1 minute of playing California clapper rail vocalization recordings, then followed by an additional minute of listening.
- For black rails, each listening station will be occupied for 1 minute of passive listening, 1 minute of "grr" calls followed by 30 seconds of "ki-ki-krrr" calls, then followed by another 3.5 minutes or passive listening.
- Sunrise surveys will begin 60 minutes before sunrise and conclude 75 minutes after sunrise (or until presence is detected).

- Sunset surveys will begin 75 minutes before sunset and conclude 60 minutes after sunset (or until presence is detected).
- Surveys will not be conducted when tides are greater than 4.5 National Geodetic Vertical Datum (NGVD) or when sloughs and marshes are more than bankfull.
- California clapper rail and California black rail vocalizations will be recorded. A GPS receiver will be used to identify call location and distance. The call type, location, distance, and time will be recorded on a data sheet.

If California clapper rail or black rail is present in the immediate construction area, the following measures will apply during construction activities.

- To avoid the loss of individual California clapper rails or black rails, activities within or adjacent to California clapper rail or black rail habitat will not occur within 2 hours before or after extreme high tides (6.5 feet or above, as measured at the Golden Gate Bridge), when the marsh plain is inundated, because protective cover for California clapper rails is limited and activities could prevent them from reaching available cover.
- To avoid the loss of individual California clapper rails or black rails, activities within or adjacent to tidal marsh areas will be avoided during the California clapper rail breeding season from February 1 through August 31 each year unless surveys are conducted to determine California clapper rail locations and California clapper rail and black rail territories can be avoided. Figure 2-5 shows the areas of known clapper rail breeding habitat.
- If breeding California clapper rails or black rails are determined to be present, activities will not occur within 700 feet of an identified calling center. If the intervening distance across a major slough channel or across a substantial barrier between the California clapper rail calling center and any activity area is greater than 200 feet, it may proceed at that location within the breeding season.
- *Exception:* Only inspection, maintenance, research, or monitoring activities may be performed during the California clapper rail or black rail breeding season in areas within or adjacent to California clapper rail breeding habitat with approval of the USFWS and DFG under the supervision of a qualified biologist.

California Least Tern

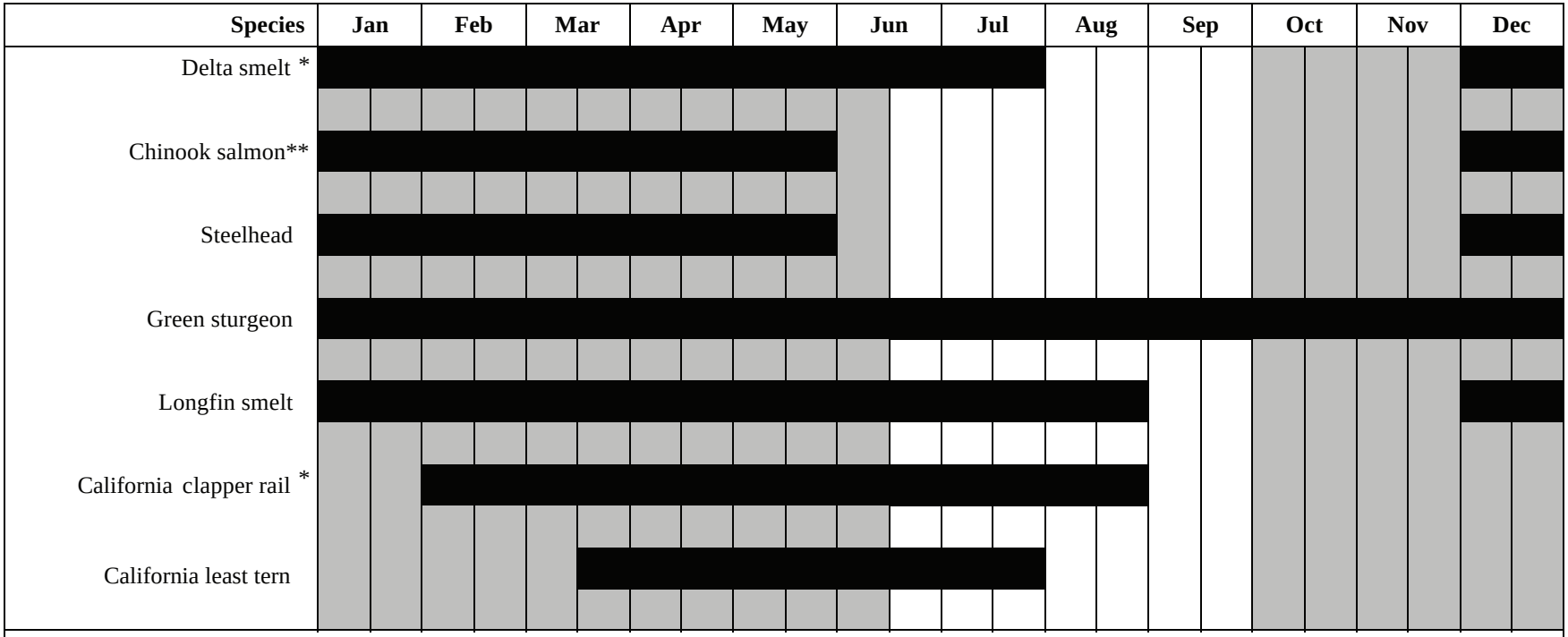
- No activities will be performed within 300 feet of an active least tern nest during the least tern breeding season, April 15 to August 15 (or as determined through surveys).
- *Exception:* Only inspection, maintenance, research, or monitoring activities may be performed during the least tern breeding season in areas within or adjacent to least tern breeding habitat with approval of the USFWS and DFG under the supervision of a qualified biologist.

Biological Monitoring

- The project proponents will provide a biologist/environmental monitor who will be responsible for monitoring implementation of the conditions in the state and federal permits (federal Clean Water Act [CWA] Section 401, 402, and 404; ESA Section 7; Fish and Game Code Section 1602 and/or 2050; project plans [SWPPP]; and EIS/EIR mitigation measures).
- The biologist/environmental monitor will determine the location of environmentally sensitive areas adjacent to each construction site based on mapping of existing land cover types and special-status plant species. If such maps are not available, the biologist/environmental monitor will map and quantify the land cover types and special-status plant populations in the proposed project footprint prior to construction.
- To avoid construction-phase disturbance to sensitive habitats immediately adjacent to the project area, the monitor will identify the boundaries of sensitive habitats and add at least a 100-foot buffer, where feasible, using orange construction barrier fencing. The fencing will be mapped on the project designs. Erosion-control fencing also will be placed at the edges of construction where the construction activities are upslope of wetlands and channels to prevent washing sediment off site. The sensitive habitat and erosion-control fencing will be installed before any construction activities begin and will be maintained throughout the construction period.
- The biologist/environmental monitor will ensure the avoidance of all sensitive habitat areas outside direct project footprints, including patches of tidal wetland along channel banks, during dredging operations, to the extent practical.
- Plants for revegetation will primarily come from natural recruitment. Plants imported to the restoration areas will come from local stock, and to the extent possible, local nurseries. Only native plants will be used for restoration efforts.

Construction Period Restrictions

Timing of restoration construction activities will depend on the type of activity, presence or absence of sensitive resources, tides, and/or water management in wetlands. In general, landside work will occur between July and September. In-water activities will be conducted during the months of August through November (Figure 2-4). Working outside this window would require additional approvals from the resource agencies. Other timing restrictions may be necessary during the hunting season, such as limiting work to days other than Saturday, Sunday, and Wednesday.



Notes:

* Delta smelt and California clapper rail are present year-round in the marsh. Black represents periods of species sensitivity to construction activities.

** Chinook salmon includes spring-, winter-, fall-, and late fall–run species.

Species presence and/or period of sensitivity

Permissible time period for construction

No construction activities can occur

Graphics/Projects/06888.06 Suisun Marsh (10-10) SS

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Figure 2-4
Work Activity Windows for Sensitive Species

Nonnative Plant Control

The project proponents will include the following measures in the project construction specifications to minimize the potential for the introduction of new noxious weeds and the spread of weeds previously documented in the project area.

- Use certified, weed-free, imported erosion control materials (or rice straw in upland areas).
- Coordinate with the county agricultural commissioner and land management agencies to ensure that the appropriate BMPs are implemented.
- Educate construction supervisors and managers on weed identification and the importance of controlling and preventing the spread of noxious weeds.
- Clean equipment at designated wash stations after leaving noxious weed infestation areas.
- Treat isolated infestations of noxious weeds identified in the project area with approved eradication methods at an appropriate time to prevent further formation of seed, and destroy viable plant parts and seed.
- Minimize surface disturbance to the greatest extent possible.
- Use certified weed-free native mixes for any restoration planting or seeding as may be necessary, as provided in the revegetation plan developed in cooperation with DFG. Mulch with certified weed-free mulch. Rice straw may be used to mulch upland areas.
- Use native, noninvasive species or nonpersistent hybrids in erosion control plantings to stabilize site conditions and prevent invasive species from colonizing.

Cultural Resources

- If any previously unknown historic or archeological artifacts are discovered while accomplishing the authorized work, the landowner must stop work immediately and notify the Corps. The activity is not authorized until the requirements of Section 106 of the NHPA have been satisfied.
- Work is not authorized within 100 feet of archeological site CAL-SOL-13.

Managed Wetland Activities Environmental Commitments

Continuation of Existing Best Management Practices and Biological Opinion Terms and Conditions

The SMPA agencies and private landowners have been maintaining property and/or facilities in the Marsh for more than three decades in compliance with existing BOs from USFWS and NMFS. Implementation of the SMP will include continuation of monitoring, fish screening, and other ongoing requirements and programs.

Implementation of the SMP will include submitting BAs to USFWS and NMFS. Terms and conditions of the revised BOs will be followed. Any adverse effects on special-status species, critical habitat, or EFH will be addressed by the project proponent, and any additional measures will be followed in compliance with CESA, ESA and EFH authorizations. Many of these requirements are described in the applicable existing conditions sections of the resource analysis sections.

Standard Design Features and Construction Practices

- When possible, drain pipes should be relocated to drain into larger receiving sloughs with good tidal circulation to avoid and minimize the degradation of water quality in receiving waters.
- All new and/or replacement drain pipes will be located on the largest possible sloughs, or sloughs with the highest levels of tidal circulation possible, to minimize or lessen the possibility of degraded water quality conditions.
- Management options, including vegetation management and diversion timing and location, will be pursued to avoid and minimize occurrence of low dissolved oxygen (DO) water conditions in managed wetlands.
- New exterior drain structures will be installed where the discharge channel already exists. The new drain will not be placed on emergent vegetation. The pipe will be installed at low tide. No in-water work is authorized.
- Landowners importing any material besides rock material from outside the Suisun Marsh must contact the RWQCB before importation. Landowners must obtain the RWQCB's concurrence that the imported material is acceptable before use.
- Material excavated from existing spreader ditches and creation of new spreader ditches may be sidecast adjacent to the ditch. No excavated material will be more than 12 inches high.
- Exterior pipes will be placed below the depth of emergent vegetation.

- Pipe replacement as well as repair, replacement, or installation of exterior water control structures will not change the existing use or diversion capacity.
- All pipes will be pre-assembled before installation to minimize work time.
- All material shall remain on the crown or interior side of the levee during the repair of exterior existing levees, the coring of existing exterior levees, and the installation of drain pumps and platforms.
- All bulkheads will be in place prior to backfilling the bulkhead during installation, repair, or re-installation of water control structures.
- Installation of drain pumps and platforms will be done entirely within the managed wetland; although discharge pipes will comply with permit terms and conditions for exterior discharge pipe installation.
- All work to be performed on the exterior side of levees shall commence and be completed within a 6-hour period, from 3 hours prior to low tide to 3 hours after low tide.
- Construction equipment used for projects will be checked each day prior to work and, if necessary, action will be taken to prevent fluid leaks. If leaks occur during work, the Corps, its permittee, or the contractor will contain the spill and remove the affected soils.
- All contractors must have a supply of erosion and pollution control materials on site to facilitate a quick response to unanticipated storm events or emergencies.
- No in-water work will occur during the repair of existing exterior levees; the coring of existing levees; pipe replacement at the exterior flood or dual-purpose gate; pipe replacement at the existing exterior drain gate; installation, repair, or re-installation of water control bulkheads; installation of drain pumps and platforms; or installation of new exterior drain structures.
- Emergent vegetation will not be disturbed during the following activities: repair of existing exterior levees, replacement of existing riprap on exterior levee, or installation of the new exterior drain structure.
- No fresh concrete, cement, silts, clay, soil, or other materials will be discharged to Marsh waters.

Reporting Requirements

Proposed work reports must be submitted to the Corps, NMFS, State Lands Commission, and RWQCB by the first day of each month. When the first day falls on a weekend, the report would be due the following Monday.

The SRCD shall prepare an annual report that summarizes the amounts and locations of activities performed. This report shall be submitted to the Corps, U.S. Environmental Protection Agency, NMFS, USFWS, State Lands Commission, and the RWQCB. This report must include an estimate regarding

temporarily affected wetlands and describe any additional minimization methods (i.e., replacing a metal pipe with HDPE pipe to lessen future maintenance needs).

The Corps and applicant shall provide a written annual report to NMFS by December 31 of each year. The report shall be submitted to the NMFS Santa Rosa Area Office, Attention: Supervisor of Protected Resources Division, 777 Sonoma Avenue, Room 325, Santa Rosa, California 95404-6528. The report shall contain, at a minimum, the following information:

i. **Project-related activities**—The report shall include the type, size, and location of specific actions (on exterior pipe replacement and installation and rip rap placement) undertaken; dates when specific actions began and were completed; a description of BMPs implemented to minimize project effects; photographs taken before, during, and after the activity from photo reference points; and a discussion of specific project performance or efficacy.

ii. **Unanticipated project effects**—The report shall include a discussion of any unanticipated project effects or unanticipated levels of project effects on salmonids, green sturgeon, and/or critical habitat and a description of any and all measures taken to minimize those unanticipated effects as well as a statement regarding whether the unanticipated effects had any effect on ESA-listed fish or critical habitat.

iii. **Gate closures and diversion curtailment**—The report shall summarize compliance monitoring for gate closures and diversion curtailments.

iv. **Observations of salmonids and green sturgeon**—The report shall document observations of any salmonids or green sturgeon occurring within the action area during project actions.

A summary of the results of water quality monitoring or evaluation of the wetland management operational modifications used is no longer required. This information was previously provided by SRCD and DFG in 2008, 2009, and 2010 to NMFS.

Riprap

Riprap replacement may occur on the slopes of interior ditches where rock has been washed away and on exterior levees where rock has been washed away or subsided.

- Riprap will not be placed directly on emergent vegetation (e.g., tules, *Scirpus* spp.).
- Emergent vegetation will not be uprooted during the placement of riprap, nor will it be displaced by riprap.
- Riprap placed on the exterior side of the levee will commence and be complete within a six-hour period, from three hours prior to low tide to three hours following low tide.

Dredging Practices

Dredging has the potential to result in adverse environmental effects if it leads to the release of fine-grained sediments or increasing turbidity, or if it remobilizes contaminated materials. The following preliminary environmental commitments will be implemented as part of the proposed dredging program to avoid and/or minimize effects on aquatic resources in Suisun Marsh.

- All construction facilities and working platforms required for dredging operations will maintain an operating environment free of fuel spills.
- Runoff generated on the job site will be controlled.
- Dredging activities will occur only between August 1 and November 30.
- Removal of emergent vegetation will be avoided where feasible, although areas of vegetation may need to be disturbed during construction to provide site access, adequate volume of material for construction, and proper water flow at the site.
- Dredging will be avoided within 200 feet of storm drain outfall and urban discharge locations, unless suitable preconstruction contaminant testing is conducted (coordination and consulting with the DMMO relative to evaluation and placement of the materials**)**.
- A berm will be constructed on the channel-side of the levee crown to prevent runoff into adjacent aquatic habitats.
- Releases of discharge water from managed wetlands will be limited following dredged material placement.
- The extent of dredging disturbance will be limited based upon slough channel habitat classification and plan region as identified in Table 2-6.
- Alternate boating routes will be identified if dredging impedes navigation.

Biological Resources Best Management Practices

Below are environmental commitments for special-status plants, birds, and fish. Any suspected take of listed species will be reported immediately to DFG and the SRCD, who will immediately contact USFWS or NMFS. Any carcasses of listed fish will be frozen in a whirl-pak bag and retained until instructions are received from the applicable agency.

Biological Monitoring

The project proponents will monitor implementation of environmental commitments pertaining to dredging, riprap placement, or work on the water side of exterior levees that removes vegetation and will provide a biologist/environmental monitor who will be responsible for monitoring implementation of the conditions of any state and federal permits (CWA

Sections 401, 402, and 404; ESA Section 7; Fish and Game Code Section 1602 and/or 2050; project plans [SWPPP]; and EIS/EIR mitigation measures).

Plants

An on-site field inspection for special-status plants will be conducted by a USFWS-approved biologist for managed wetlands activities on the water side of exterior levees. This includes all water control structure replacement and rip rap placement, except when a headwall is present; installation of exterior water control structures; alternative bank protection placement; and dredging and other facility maintenance activities that remove vegetation. Special-status plants include:

- soft bird's beak (*Cordylanthus mollis* ssp. *mollis*),
- salt marsh bird's beak (*C. maritimus* ssp. *maritimus*)
- hispid bird's beak (*C. mollis* ssp. *hispidus*)
- Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*)
- Mason's lilaeopisis (*Lilaeopsis masonii*)
- Suisun thistle (*Cirsium hydrophilum* var. *hyrdophilum*)
- Suisun Marsh aster (*Aster lentus*)
- alkali milk-vetch (*Astragalus tener*)
- heartscale (*Atriplex cordulata*)
- brittlescale (*Atriplex depressa*)
- valley spearscale (*Atriplex joaquiniana*)

If a special-status plant is found during a survey, it should be avoided, and a map showing the location of the plant should be provided to DFG, the Corps, and USFWS no later than 7 calendar days after the survey is completed. If a special-status plant cannot be avoided during the proposed work and it is not listed as threatened or endangered, the plant will be carefully transplanted to the nearest suitable habitat provided this action and the proposed transplantation site are determined by DFG to be adequate to offset any impact. If approved by DFG, a qualified representative of SRCD or DFG may conduct the transplantation. If DFG does not determine that transplantation will offset the impact, a restoration plan will be prepared and implemented, after DFG approval, that will be able to ensure that impacts on the plant population are offset. This determination by DFG will include an assessment of species distribution, the abundance in the Marsh, and the level of proposed impact.

If a federally listed threatened or endangered plant is found that cannot be avoided during the proposed work, the qualified representative of SRCD or DFG will notify the Corps immediately so it can consult with the USFWS. If determined necessary by USFWS and if a federally listed plant cannot be avoided

during the proposed work, the plant will be carefully transplanted to the nearest suitable habitat provided this action and the proposed transplantation site is determined by USFWS to be adequate to offset any impact. If approved by USFWS, a qualified representative of SRCD or DFG may conduct the transplantation. If USFWS does not determine that transplantation will offset the impact, a restoration plan will be prepared and implemented, after USFWS approval, that will be able to ensure that impacts on the plant population are offset. This determination by USFWS will include an assessment of species distribution, abundance in the Marsh, and the level of proposed impact.

Birds

- Work may not be conducted in California clapper rail habitat between February 1 and August 31 unless surveys indicate that CCR is not present. Figure 2-5 depicts the areas of habitat to be avoided during this time.
- Impacts on great blue heron and egret rookeries will be avoided and minimized by removing mature trees only outside the nesting season and maintaining a 500-foot buffer between roost sites and managed wetland activities during the nesting season.
- Managed wetland activities in the vicinity of active raptor nests will not be implemented during breeding season.

Fish

- To minimize entrainment losses of fish throughout the Marsh, water control structures will be consolidated and/or equipped with state-of-the-art fish screens when practicable and as funding allows. Intakes that present the highest risk of entrainment to salmonid smolts should be given the highest priority, including intakes located on Montezuma, Suisun, and Cordelia Sloughs.
- Any new or enlarged exterior water control structures will be screened in accordance with DFG's criteria unless DFG and the Corps determine that the structure would not adversely affect any listed species and the Corps obtains concurrence for any federally listed species with that determination from NMFS or USFWS as applicable.
- Water control structures may be installed or replaced only during low tides (within a 6-hour period, from 3 hours prior to low tide to 3 hours following low tide) when there is the least chance of affecting fish.
- SRCD and DFG will continue to identify and prioritize placement of water control structures that require fish screens in consultation with the Corps, NMFS, and the USFWS. The SRCD and DFG will seek funding to install screens at the highest-priority sites.
- Water control structures will be operated to minimize impacts on listed fish, taking into consideration seasonal timing and water quality.

- All in-water work will be done by hand and during low tide (within a 6-hour period, from 3 hours prior to low tide to 3 hours following low tide) as part of the following activities: repair, replacement, or installation of exterior water control structures; pipe replacement at the exterior flood or dual-purpose gate; pipe replacement at the existing exterior drain gate; and installation of the new exterior drain structure.
- All levee repairs and pipe replacements will be restricted to the dry season and not done in the rain.
- Repairs of existing exterior levees, to stop the flow of tidal waters entering into the managed wetlands, shall be completed within 7 days of the breach for coverage under the RGP.
- Fish screens will be installed on any new or enlarged water control structures.
- No more than 1,000 square feet of wetlands throughout the Marsh per year shall be filled during installation of fish screens.
- A biologist or on-site monitor shall evaluate each site during project implementation of exterior pipe replacement or riprap placement to document project actions for the purpose of identifying any condition that could adversely affect salmonids, green sturgeon, or their habitat. Whenever conditions are identified that could adversely affect salmonids, green sturgeon, or their habitat in a manner not described in the opinion, the Corps, its permittee, or the contractor shall immediately notify a NMFS biologist.
- If the Corps, its permittee, or the contractor identifies a project-related condition that could adversely affect salmonids, green sturgeon, or their habitat in a manner not anticipated, the Corps, its permittee, or the contractor will be responsible for rectifying such changes in a timely manner.
- If the managed wetlands are subject to uncontrolled tidal flow, dewatering of the managed wetland area will be conducted through the use of existing gravity tidal drainage gates as much as possible. DFG will be consulted to determine if fish salvage efforts are needed prior to completely dewatering of the site.

Water Diversion Restrictions

- SRCD shall notify DFG, NMFS, and the Corps of the starting and closing dates of duck hunting season annually at least 1 month prior to the start of the season. Landowners diverting water from sloughs designated by NMFS (i.e., Montezuma Slough and its tributaries lower Nurse Slough [from the confluence with Denverton Slough to Montezuma], Denverton Slough; Cuttoff Slough [including Spring Branch Slough, first and second Mallard Branch Slough]; Suisun Slough, [from downstream of the confluence with Boynton Slough to Grizzly Bay; and Chipps Island]) shall use no more than 25% of the water control structure's diversion capacity from November 1 to the last day of duck hunting season. These landowners are prohibited from diverting water from designated sloughs from February 21 to March 31. The

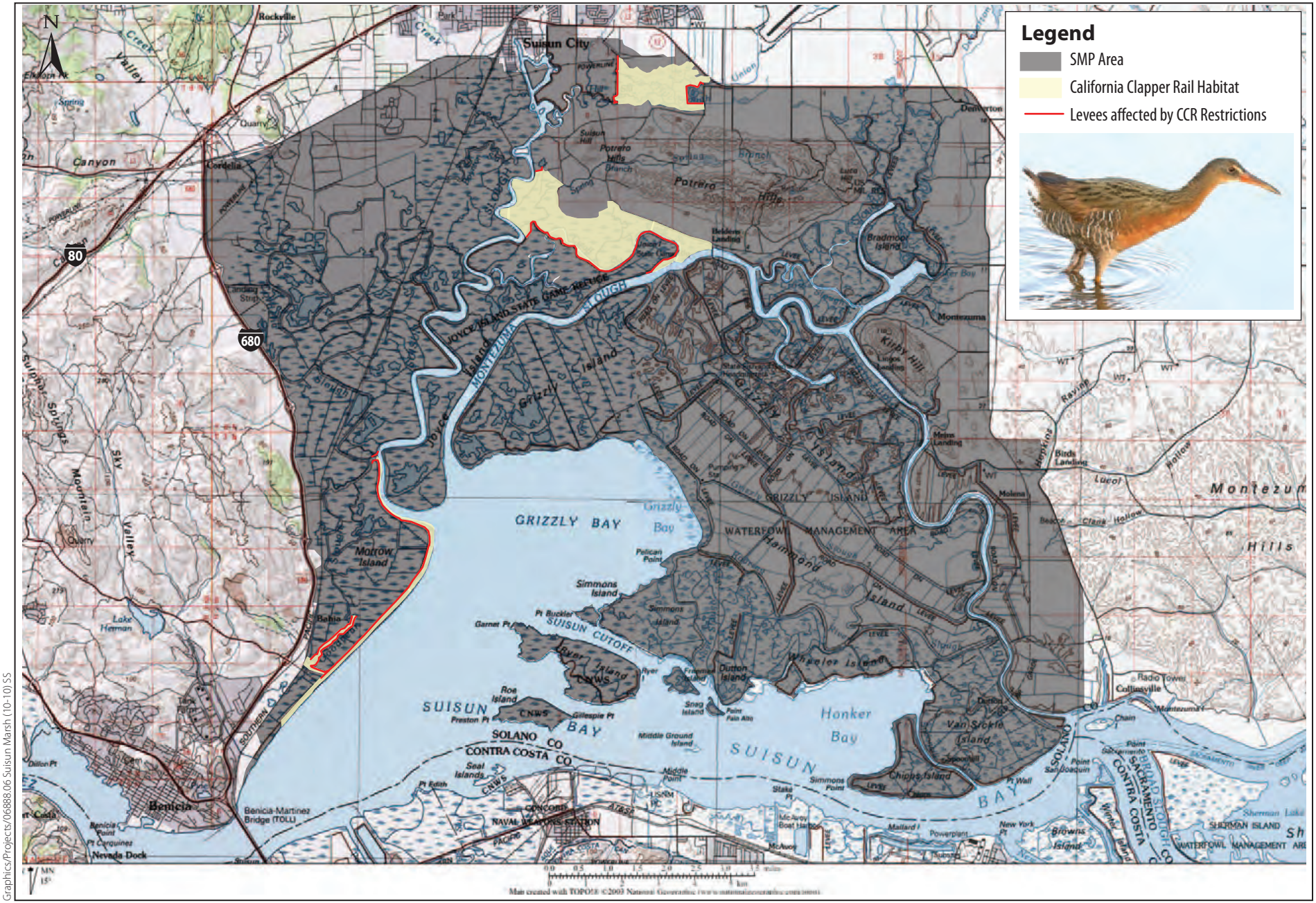

Figure 2-5
California Clapper Rail Habitat in Suisun Marsh

purpose of these diversion restrictions is to protect migrating salmonids and longfin smelt. The following table describes the diversion restrictions.

Table 2-10. Inches of Water Discharged through Pipe for Salmonid Restriction

Diameter of Pipe (inches)	25% Open (inches)
12	3
18	4
24	6
30	7
36	9
48	12

- Landowners diverting water from sloughs designated by NMFS (i.e., Montezuma Slough and its tributaries lower Nurse Slough [from the confluence with Denverton Slough to Montezuma], Denverton Slough; Cuttoff Slough [including Spring Branch Slough, first and second Mallard Branch Slough]; Suisun Slough, [from downstream of the confluence with Boynton Slough to Grizzly Bay; and Chipps Island]) shall use only 35% of the water control structure's intake capacity between April 1 and May 31. If, during this time, two out of the three DFG 20-millimeter trawl surveys sites (sites 606, 609, and 610) predict delta smelt densities greater than 20 delta smelt individuals per 10,000 cubic meters over a 2-week sampling period, all diversions from these sloughs shall use only 20% of the water control structure's intake capacity. Survey trawls shall take place at least once every 14 days between April 1 and May 31. The table below determines delta smelt diversion restrictions.

Table 2-11. Inches of Water Discharging through Pipe for Delta Smelt Restriction

Diameter of Pipe (inches)	20% Open (inches)	35% Open (inches)
12	3	5
18	4	7
24	5	8.5
30	6	10.5
36	7	13
48	8	17

- While diversion restrictions are in place, SRCD and DFG shall monitor gate closures. If an open gate is observed, they shall immediately contact the landowner, and the gates shall be brought into compliance.

Construction Period Restrictions

Timing of construction activities will depend on the type of activity, presence or absence of sensitive resources, tides, and/or water management in wetlands. In general, in-water work will occur between August 1 and November 30, which avoids most of the special-status fish species. Additionally, most of the managed wetland activities are expected to be implemented from June to September when the wetlands are dry enough to conduct these activities (Figure 2-4). Activities may be conducted during other times of the year, depending on the potentially affected species for each site-specific case. Activities occurring during the hunting season will not occur on Saturday, Sunday, or Wednesday when such activities have a reasonable possibility of disrupting access to hunting or represent a safety concern. Furthermore, construction will not occur during major summer holiday periods and adequate warnings signs, postings, and/or notices will be provided upstream and downstream of all construction equipment, sites, and activities to warn recreational boaters. Finally, signs describing alternate boating routes will be posted when construction activities limit and/or restrict boating access.

Hazardous Materials Management Plan

A hazardous spill plan will be developed for the managed wetland activities. The plan will describe the actions that will be taken in the event of a spill. The plan also will incorporate preventive measures to be implemented (such as measures pertaining to vehicle and equipment staging, cleaning, maintenance, and refueling) as well as contaminant management and storage (e.g., fuel). In the event of a contaminant spill, work at the site will cease until the contractor has contained and mitigated the spill. The contractor will immediately prevent further contamination, notify appropriate authorities, and mitigate damage as appropriate. Adequate spill containment materials, such as oil diapers and hydrocarbon cleanup kits, will be available on site at all times.

Cultural Resources

- If any previously unknown historic or archeological artifacts are discovered while accomplishing the authorized work, the landowner must stop work immediately and notify the Corps. The activity is not authorized until the requirements of Section 106 of the NHPA have been satisfied.
- Work is not authorized within 100 feet of archeological site CAL-SOL-13.

Chapter 3
Guide to Impact Analysis

Guide to Impact Analysis

This chapter is included to help readers understand how the impact analyses are presented in resource Chapters 5, 6, and 7. Information on the environmental consequences of the alternatives presented in this document was prepared by a team of resource specialists using and building upon a series of technical reports, including the Bay-Delta and Suisun Marsh ecological processes and species conceptual models. Chapter 4 summarizes the environmental consequences as a result of the SMP, and compares the various alternatives in terms of environmental impacts and outcomes. Chapters 8 and 9 discuss growth-inducing and cumulative impacts, respectively, as a result of implementing the proposed project. Resources evaluated in this EIS/EIR have been grouped into three main categories:

- physical environment;
- biological environment; and
- land and water use, social issues, and economics.

This EIS/EIR evaluates a range of alternatives that vary in both the acres of tidal wetlands restored and the remaining acres of managed wetlands that would be enhanced. The possible effects of each of these alternatives on each resource area are examined in each section.

Impact Analysis Organization

The impact analysis for each resource is divided into several parts, including a summary, a description of the affected environment/existing conditions, and discussions of environmental consequence. Separate chapters discuss and analyze growth-inducing and cumulative impacts. Each of these divisions is explained more fully below.

Introduction

The introduction provides an overview of the primary concerns, impacts, and mitigation measures of each section. It also summarizes methods used in the resource analysis.

Summary of Impacts

A summary of impacts on each resource is presented in table format at the beginning of each resource section. These tables show the impact, applicable alternatives, any applicable mitigation, and the final level of significance. This information is also provided in Table 4-1.

Affected Environment

The Affected Environment section provides a historical perspective and a detailed description of the current conditions for each resource. This information is obtained from published environmental documentation, books, web sites, research and journal articles, and personal communications with experts in their fields.

Regulatory Setting

This section lists and describes laws, regulations, and policies that affect the resource or the assessment of impacts on the resource. Often, as in water quality and biological resources, the regulatory framework is the basis for the conclusion of the level of significance, and therefore plays a crucial role in impact assessment. Laws, regulations, and policies that apply to more than one resource topic are also listed in Chapter 10, "Compliance with Applicable Laws, Policies, and Plans and Regulatory Framework." More detailed regulatory framework that is unique to a resource section will be found in the specific section.

Environmental Impacts

Assessment Methods

Descriptions of assessment methods are resource-specific and provide the approach used to identify and assess the environmental impacts for the resource category. Analytical models used in the evaluation also are identified.

Significance Criteria

This section describes thresholds of significance used for that particular resource. While CEQA requires that a determination of significant impacts be stated in an EIR, NEPA does not. Under NEPA, significance is used to determine whether an EIS or some other level of documentation is required, and once a decision to prepare an EIS is made, the magnitude of the impact is evaluated and no further judgment of significance is required. As such, the significance criteria and associated significance conclusions are for purposes of CEQA compliance. Significance criteria also provide a tool to predict whether it is likely that the impacts identified as potentially significant can be avoided, reduced, or mitigated to a less-than-significant level.

No Action Alternative

This section presents the environmental impacts of the No Action Alternative. The No Action Alternative represents the likely future conditions without implementation of the SMP. The No Action alternative is compared to the same baseline (existing conditions) as the action alternatives.

Action Alternatives

It is required by both CEQA and NEPA that a reasonable range of alternatives to the project be identified. Alternatives are developed to show the difference in environmental consequences among varying approaches to a project. Alternatives are feasible and satisfy the objectives and needs of the proposed project. They may identify activities, operations, or construction methods that could lessen adverse impacts on the environment while accomplishing the same objectives and goals. This EIS/EIR fully analyzes all alternatives identified in Chapter 2.

Growth-Inducing Impacts

Growth-inducing impacts are those that "foster economic or population growth" or that "remove obstacles to growth" (State CEQA Guidelines section 15126.2[d]). Chapter 8 discusses the growth-inducing impacts that may result from implementation of the SMP. Specifically, the potential for this plan to promote growth in the Suisun Marsh area is analyzed. Chapter 8 provides a full discussion of growth-inducing impacts as a result of the SMP alternatives.

Cumulative Impacts

Cumulative environmental impacts must be addressed in EISs and EIRs under both NEPA and CEQA. NEPA defines cumulative impacts as those impacts that result from the

> incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency… or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

The definition of cumulative impacts under CEQA is similar:

> Cumulative impacts refer to two or more individual impacts that, when considered together, are considerable or that compound or increase other environmental impacts. The cumulative impact of several projects is the change in the environment that results from the incremental impact of the project when added to other, closely related past, present, or reasonably foreseeable, probable future projects.

The analysis of cumulative impacts in this document is a separate chapter (Chapter 9) and considers long-term environmental impacts of this project, including those that would be less than significant, together with similar impacts of other projects for each resource.

In general, the analysis of cumulative impacts is qualitative. Impacts were identified based on: (1) information extracted from existing environmental documents or studies for the resource categories potentially affected by each project, (2) investigation of other state and federal agencies' and privately funded project plans in the Suisun Marsh area over the next 30 years, and (3) knowledge of expected effects of similar projects in the study area.

Mitigation Measures

Mitigation measures are intended to avoid, reduce, or compensate for adverse impacts on a resource and can include actions such as implementation of plans to minimize impacts. For each impact identified as significant, a mitigation measure to reduce that impact to a less-than-significant level is described. However, some significant unavoidable impacts remain related to disturbance of cultural resources.

Chapter 4
Summary of Environmental Consequences

Introduction

This chapter summarizes the impacts identified as a result of constructing and operating the Proposed Project and alternatives. Full discussion of impacts on resources may be found in the specific resource sections in Chapters 5, 6, 7, and discussion of growth-inducing and cumulative impacts may be found in Chapters 9 and 10, respectively. This chapter also articulates the relationship between short-term uses and long-term productivity, irreversible and irretrievable commitment of resources, significant unavoidable impacts, estimated land use changes as a result of the plan, and presents a summary of how each alternative meets each plan objective.

Impacts

Impacts resulting from implementation of the SMP are determined by comparing the Proposed Project and alternatives to the existing conditions. When an impact meets or exceeds the thresholds of significance, it is determined to be a significant impact. All applicable mitigation is proposed to reduce the magnitude of that impact. Table 4-1, at the end of this chapter, summarizes the impacts resulting from each alternative, as well as mitigation measures proposed for adoption and the final level of significance. In some cases, a significant impact cannot be mitigated to a less-than-significant level.

Significant and Unavoidable Impacts

Four significant, unavoidable impacts have been identified related to cultural resources impacts: damage to Montezuma Slough Rural Historic Landscape as a result of ground disturbance, damage to known cultural resources as a result of inundation, inadvertent damage to as-yet-unidentified cultural resources as a result of ground disturbance in restoration areas, and damage to or destruction of such resources as a result of ground disturbance in managed wetland areas.

The four significant and unavoidable cultural resources impacts are described in Section 7.7, Cultural Resources. These impacts would transpire under any of the action alternatives and to a lesser degree the No Action alternative. The impacts

have been determined to be significant and unavoidable because the cultural resources—both known and as-yet-unidentified—involved have not been formally evaluated for significance under federal, state, or local cultural resources regulations. Additionally, the proposed mitigation measures would not necessarily reduce the identified impacts to a less-than-significant level: the complete destruction of archaeological sites, for instance, cannot be fully mitigated due to the non-renewable nature of the resource.

Summary of Each Alternative's Ability to Meet the Plan Objectives

The Proposed Project is designed to meet the purposes/objectives as described in Chapter 1. Alternatives B and C meet at least most of the purposes/objectives. However, one may do so better or in ways different from others. This section provides an overview of how each alternative, including the Proposed Project, specifically meets each of the separate purposes/objectives.

No Action Alternative

The No Action Alternative does not meet most of the plan purposes/objectives. Absent the SMP and local and regulatory agency support, no major restoration would occur in the Marsh and managed wetland activities would be substantially limited or suspended. As a result, levee integrity would continue to degrade and recreational opportunities would decrease. As a result of suspended maintenance and resulting operations of duck clubs in the Marsh, efficiency of flooding and draining managed wetlands would not be maximized or improved. The absence of draining low DO water from some managed wetlands into sloughs has the potential to improve water quality in some areas under certain conditions. However, overall, there would be little if any improvement in habitats for waterfowl, fish, shorebirds, or other species because managed wetlands could not be operated to their full potential, and there would still be limited tidal marsh habitat available for terrestrial and aquatic species. It is assumed that habitats, levees, public and private land use, and water quality would continue to degrade absent the SMP.

Alternative A, Proposed Project: Restore 5,000–7,000 Acres

Alternative A is the Proposed Project because it is viewed by the lead agencies as the alternative that best meets most of the plan purposes/objectives as described below.

Habitats/Ecological Processes

Alternative A allows for a significant amount of tidal wetland restoration, which is also determined to be an acceptable range for the current landowners in the Marsh and is consistent with restoration and enhancement goals of the ERPP. As a trade-off for implementing this restoration, the remaining managed wetlands/duck clubs would be allowed to continue managed wetland activities, leading to better habitats for waterfowl, shorebirds, and other species that depend or rely on managed wetlands. Restoration of tidal wetlands is assumed to provide habitats for several special-status aquatic and terrestrial species and improve the overall ecosystem functions in the Marsh.

Public and Private Land Use

Improvements in managed wetlands along with increasing the area of navigable waters in the Marsh through restoration are assumed to improve public and private land use opportunities, including fishing, bird watching, and other activities such as non-consumptive recreation. The conversion of privately managed wetlands to public tidal wetlands will provide increased public hunting opportunities.

Levee System Integrity

Through the implementation of managed wetland activities, landowners in the Marsh would be better equipped to maintain and improve levees to protect against catastrophic flood events. Additionally, restoration would include improvements to interior levees that would need to function as exterior levees, allowing the opportunity to ensure that these levees adequately protect managed wetlands, provide habitat, and incorporate erosion control that is environmentally sensitive and is not likely to need replacement.

Water Quality

Water quality constituents of concern in the Marsh are salinity, DO, mercury, suspended sediment, and other parameters regulated by the State Water Board. Restoration would result in a reduction in total acres of managed wetlands, decreasing managed wetland discharges. For those properties that cause DO sags and other water quality problems, restoration has the potential to improve water quality. Additionally, managed wetland activities are intended to improve flood and drain operations, potentially improving discharge water quality. The water quality improvement would depend on the actual sites restored and the managed wetlands that improve their flood and drain capabilities using the managed wetland activities.

Alternative B: Restore 2,000–4,000 Acres

Alternative B is similar to Alternative A, but differs in the extent to which it meets each plan purpose/objective because of the difference in acres of restoration and areas subject to managed wetland activities. Alternative B would restore fewer acres, leaving more area subject to managed wetland activities.

Habitats/Ecological Processes

Alternative B includes less restoration than Alternative A. As a trade-off for implementing this restoration, the remaining managed wetlands/duck clubs would be enhanced to improve management capabilities, leading to better habitats for waterfowl, shorebirds, and other species that depend or rely on managed wetlands. Compared to both existing conditions and Alternative A, there would be more managed wetland activities and more of the resultant improvements in habitats for reliant species. Restoration of tidal wetlands is assumed to provide habitats for several special-status aquatic and terrestrial species. Although this would be an improvement compared to existing conditions, this would be approximately 2,000 fewer acres of tidal wetlands in the Marsh compared to Alternative A, and this alternative would not fully achieve the desired results related to ecological processes.

Public and Private Land Use

Improvements in managed wetlands along with increasing the area of navigable waters in the Marsh through restoration are assumed to improve public and private land use opportunities, including fishing, hunting, bird watching, and activities. Alternative B would be an improvement of these opportunities compared to existing conditions, but compared to Alternative A, there would be more hunting, bird watching, and other land-based recreational opportunities and less fishing, as there would be less navigable water and public access.

Levee System Integrity

Through the implementation of managed wetland activities, landowners in the Marsh would be better equipped to maintain and improve levees to protect against catastrophic flood events compared to the existing condition. Compared to Alternative A, there would be less restoration, and therefore more levees requiring maintenance would remain intact. As such, this component of the SMP would require more resources to maintain the same level of integrity.

Water Quality

Water quality constituents of concern in the Marsh are salinity, DO, mercury, suspended sediment, and other parameters regulated by the State Water Board. Compared to the No Action Alternative, restoration would result in a reduction in total acres of managed wetlands, reducing managed wetland discharges, which can cause low DO and other water quality issues in some locations under certain circumstances. As such, water quality would be improved compared to the existing conditions. Compared to Alternative A, Alternative B would result in the preservation of more managed wetlands, and therefore improvements in water quality would be less.

Alternative C: Restore 7,000–9,000 Acres

Alternative C is similar to Alternative A, but differs in the extent to which it meets each plan purpose/objective because of the difference in acres of restoration and areas subject to managed wetland activities. Alternative C would restore more acres, leaving less area subject to managed wetland activities.

Habitats/Ecological Processes

Alternative C includes more restoration than Alternative A. As this alternative calls for up to 9,000 acres of tidal marsh restored over the 30-year SMP implementation period, it would result in the most benefits to species and processes related to tidal wetlands compared to the other alternatives. However, as a trade-off for implementing this restoration, almost 20% of the existing managed wetlands would be converted, which could result in substantial changes to habitats and processes related to managed wetlands. Similar to Alternatives A and B, the remaining managed wetlands/duck clubs would be subject to managed wetland activities, leading to higher quality habitats for waterfowl, shorebirds, and other species that depend or rely on managed wetlands. It may be difficult to meet the goals related to habitats and ecological processes for species that depend on or use managed wetlands under this Alternative, especially for species that do not use tidal wetland habitats.

Public and Private Land Use

Improvements in managed wetlands along with increasing the area of navigable waters in the Marsh through restoration are assumed to improve public and private land use opportunities, including fishing, bird watching, and non-consumptive recreational activities. Alternative C would be an improvement of these opportunities compared to existing conditions, but compared to Alternative A, there would be less hunting, bird watching, and other land-based recreational opportunities, and more fishing as there would be more navigable water and public access.

Levee System Integrity

Through the implementation of managed wetland activities, landowners in the Marsh would be better equipped to maintain and improve levees to protect against catastrophic flood events. Compared to Alternative A, there would be more restoration, and therefore fewer levees requiring maintenance would remain intact. As such, this component of the SMP would require fewer resources to maintain the same level of integrity.

Water Quality

Restoration would result in a reduction in total acres of managed wetlands, reducing managed wetland discharges, which can cause low DO and other water quality issues in some locations under certain circumstances. As such, water quality would be improved compared to the existing conditions. Compared to Alternative A, Alternative C would result in the preservation of fewer managed wetlands, and therefore potentially greater improvements in water quality.

Table 4-1. Summary of Impacts and Mitigation Measures

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
WATER SUPPLY AND MANAGEMENT				
Restoration Impacts				
WTR-1: Reduction in Water Availability for Riparian Water Diversions to Managed Wetlands Upstream or Downstream of Restoration Areas	A, B, C	Less than significant	None required	–
WTR-2: Increased Tidal Velocities from Breaching of Managed Wetlands Levees	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
WTR-3: Improved Water Supply as a Result of Improved Flooding and Draining of Managed Wetlands	A, B, C	Beneficial	–	–
WTR-4: Increased Tidal Flows and Improved Water Supply as a Result of Dredging	A, B, C	Beneficial	–	–
WATER QUALITY				
Restoration Impacts				
WQ-1: Increased Salinity in Suisun Marsh Channels from Increased Tidal Flows from Suisun Bay (Grizzly Bay) as a Result of Restoration	A, B, C	Less than significant	None required	–
WQ-2: Changes to Salinity of Water Available for Managed Wetlands from October to May	A, B, C	Less than significant	None required	–
WQ-3: Increased Salinity at Delta Diversions and Exports	A, B, C	Less than significant	None required	–
WQ-4: Possible Changes to Methylmercury Production and Export as a Result of Tidal Restoration	A, B, C	Less than significant	None required	–
WQ-5: Improved Dissolved Oxygen Concentrations in Tidal Channels from Reduced Drainage of High Sulfide Water from Managed Wetlands	A, B, C	Beneficial	None required	–
WQ-6: Temporary Changes in Water Quality during Construction Activities	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
Managed Wetland Activities Impacts				
WQ-7: Temporary Degradation of Water Quality during Implementation of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WQ-8: Temporary Degradation of Water Quality during Dredging, Including Possible Increases in Mercury Concentrations	A, B, C	Less than significant	None required	–
GEOLOGY AND GROUNDWATER				
Restoration Impacts				
GEO-1: Potential to Create Unstable Cut or Fill Slopes	A, B, C	Less than significant	None required	–
GEO-2: Potential for Accelerated Soil Erosion	A, B, C	Beneficial or Less than significant	None required	–
GEO-3: Potential Loss of Topsoil Resources	A, B, C	Less than significant	None required	–
GEO-4: Reduction in Availability of Non-Fuel Mineral Resources	A, B, C	Less than significant	None required	–
GEO-5: Reduction in Availability of Natural Gas Resources	A, B, C	Less than significant	None required	–
GW-6: Potential for Altered Salinity in Shallow Suisun Marsh Groundwater	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
GEO-1: Potential to Create Unstable Cut or Fill Slopes	A, B, C	Less than significant	None required	–
GEO-2: Potential for Accelerated Soil Erosion	A, B, C	Beneficial or Less than significant	None required	–
GEO-5: Reduction in Availability of Natural Gas Resources	A, B, C	No impact	–	–
GEO-7: Potential for Damage to Structures as a Result of Surface Fault Rupture, Groundshaking and/or Seismically Induced Ground Failure (Liquefaction)	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
GEO-8: Potential for Damage to Structures as a Result of Landslides, Including Seismically Induced Landslides	A, B, C	Less than significant	None required	–
FLOOD CONTROL AND LEVEE STABILITY				
Restoration Impacts				
FC-1: Increased Potential for Catastrophic Levee Failure and Flooding Resulting from Restoration Activities That Expose Interior Levees to Tidal Action	A, B, C	Less than significant	None required	–
FC-2: Changes in Flood Stage and Flow Capacity in Suisun Marsh Channels as a Result of Increased Tidal Prism and Flood Storage Capacity	A, B, C	Beneficial	–	–
FC-3: Temporary Decrease in Levee Stability Resulting from Construction Activities	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
FC-4: Reduction in Potential for Catastrophic Levee Failure and Flooding Resulting from Improvements in Exterior Levee Maintenance	A, B, C	Beneficial	–	–
SEDIMENT TRANSPORT				
Restoration Impacts				
ST-1: Increased Scour in Bays or Channels Upstream and Downstream of Habitat Restoration Areas	A, B, C	Less than significant	None required	–
ST-2: Deposition of Sediment in the Restored Tidal Wetlands	A, B, C	Beneficial or Less than significant	None required	–
ST-3: Changes in Regional Sedimentation and Scour Patterns in Suisun Marsh	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
ST-4: Increase in Erosion Adjacent to Dredging Sites	A, B, C	Less than significant	None required	–
ST-5: Increase in Deposition at Dredging Sites	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
TRANSPORTATION AND NAVIGATION				
Restoration Impacts				
TN-1: Temporary Addition of Vehicles to Roadway System and Alteration of Patterns of Vehicular Circulation during Construction Activities	A, B, C	Less than significant	None required	–
TN-2: Temporary Increases in Road Hazards during Construction Activities	A, B, C	Less than significant	None required	–
TN-3: Damage to Roadway Surfaces from Construction Activities	A, B, C	Less than significant	None required	–
TN-4: Impacts to Air Traffic Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
TN-5: Impacts on Land Use Attributable to Restoration Activities within Travis Air Force Base Zone	A, B, C	Less than significant	None required	–
TN-6: Temporary Reduction in Boat Access during Construction Activities	A, B, C	Less than significant	None required	–
TN-7: Decrease in Rail Line Integrity and Disruption to Rail Service	A, B, C	Less than significant	None required	–
TN-8: Short-Term Reduction in Navigable Areas Resulting from Increased Velocities after Restoration Activities	A, B, C	Less than significant	None required	–
TN-9: Temporary Reduction in Boat Access during Dredging Activities	A, B, C	Less than significant	None required	–
TN-10: Increases in Navigable Areas of Suisun Marsh	A, B, C	Beneficial	–	–
TN-11: Operations and Maintenance Increase in Traffic	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
TN-1: Temporary Addition of Vehicles to Roadway System and Alteration of Patterns of Vehicular Circulation during Construction Activities	A, B, C	Less than significant	None required	–
TN-2: Temporary Increases in Road Hazards during Construction Activities	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
TN-3: Damage to Roadway Surfaces from Construction Activities	A, B, C	Less than significant	None required	–
TN-4: Impacts to Air Traffic Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
TN-5: Impacts on Land Use Attributable to Restoration Activities within Travis Air Force Base Zone	A, B, C	Less than significant	None required	–
TN-6: Temporary Reduction in Boat Access during Construction Activities	A, B, C	Less than significant	None required	–
TN-7: Decrease in Rail Line Integrity and Disruption to Rail Service	A, B, C	Less than significant	None required	–
TN-9: Temporary Reduction in Boat Access during Dredging Activities	A, B, C	Less than significant	None required	–
TN-11: Operations and Maintenance Increase in Traffic	A, B, C	Less than significant	None required	–
AIR QUALITY				
AQ-1: Generation of Construction-Related Emissions in Excess of Draft BAAQMD Standards Associated with Restoration	A, B, C	Significant	AQ-MM-1: Limit Construction Activity during Restoration AQ-MM-2: Reduce Construction NO_X Emissions AQ-MM-3: Implement All Appropriate BAAQMD Mitigation Measures	Less than significant
AQ-2: Generation of Construction-Related Emissions in Excess of Draft BAAQMD Standards Associated with Current Management Activities	A, B, C	Significant	AQ-MM-2: Reduce Construction NO_X Emissions AQ-MM-3: Implement All Appropriate BAAQMD Mitigation Measures	Less than significant
AQ-3: Generation of Construction-Related Emissions in Excess of Draft BAAQMD Standards Associated with New Management Activities	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
AQ-4: Generation of Construction-Related Emissions in Excess of Draft BAAQMD Standards Associated with Restoration and Management Activities Combined	A, B, C	Significant	AQ-MM-1: Limit Construction Activity during Restoration AQ-MM-2: Reduce Construction NO_X Emissions AQ-MM-3: Implement All Appropriate BAAQMD Mitigation Measures AQ-MM-4: Limit Construction Activity during Restoration and Management	Less than significant
AQ-5: Construction-Related Diesel Health Risk Associated with Restoration	A, B, C	Less than significant	None required	–
AQ-6: Construction-Related Diesel Health Risk Associated with Current Management Activities	A, B, C	Less than significant	None required	–
AQ-7: Construction-Related Diesel Health Risk Associated with New Management Activities	A, B, C	Less than significant	None required	–
AQ-8: Construction-Related Diesel Health Risk Associated with Restoration and Management Activity Combined	A, B, C	Less than significant	None required	–
AQ-9: Increase in Construction Emissions in Excess of Federal *de Minimis* Thresholds	A, B, C	Less than significant	None required	–
AQ-10: Increase in Construction-Related Odor	A, B, C	Less than significant	None required	–
NOISE				
Restoration Impacts				
NZ-1: Temporary Increases in Ambient Noise during Construction Activities Associated with Restoration	A, B, C	Less than significant	None required	–
NZ-2: Temporary Exposure of Sensitive Land Uses to Groundborne Vibration or Noise from Construction Activities	A, B, C	Less than significant	None required	–
NZ-3: Permanent Increases in Ambient Noise	A, B, C	Less than significant	None required	–
NZ-4: Exposure of Noise-Sensitive Land Uses to Noise from Material Hauling Operations	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
Managed Wetland Activities Impacts				
NZ-2: Temporary Exposure of Sensitive Land Uses to Groundborne Vibration or Noise from Construction Activities	A, B, C	Less than significant	None required	–
NZ-3: Permanent Increases in Ambient Noise	A, B, C	Less than significant	None required	–
NZ-4: Exposure of Noise-Sensitive Land Uses to Noise from Material Hauling Operations	A, B, C	Less than significant	None required	–
NZ-5: Temporary Increases in Ambient Noise during Construction Activities Associated with Management Activities	A, B, C	Less than significant	None required	–
NZ-6: Exposure of Noise-Sensitive Land Uses to Noise from Portable Pump Operations	A, B, C	Significant	NZ-MM-1: Limit Noise from Pump Operations	Less than significant
CLIMATE CHANGE				
CC-1: Construction-Related Changes in Greenhouse Gas Emissions	A, B, C	Less than significant	None required	–
CC-2: Permanent Changes in Greenhouse Gas Sources and Sinks	A, B, C	Beneficial	None required	–
CC-3: Degradation of Wetland Habitat and Ecosystem Health as a Result of Inundation Associated With Sea Level Rise	No Action Alternative	–	–	
CC-3: Degradation of Wetland Habitat and Ecosystem Health as a Result of Inundation Associated With Sea Level Rise	A, B, C	Beneficial	None required	–
FISH				
Restoration Impacts				
FISH-1: Construction-Related Temporary Impairment of Fish Survival, Growth, and Reproduction by Accidental Spills or Runoff of Contaminants (Heavy Metals)	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
FISH-2: Construction-Related Temporary Reduction of Special-Status Fish Rearing Habitat Quality or Quantity through Increased Input and Mobilization of Sediment	A, B, C	Less than significant	None required	–
FISH-3: Short-Term Impairment of Delta Smelt Passage and Reduced Availability of Spawning and Rearing Habitat Resulting from Changes in Channel Morphology and Hydraulics Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-4: Short-Term Impairment of Chinook Salmon Passage and Reduced Availability of Rearing Habitat Resulting from Changes in Channel Morphology and Hydraulics Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-5: Short-Term Impairment of Steelhead Passage and Reduced Availability of Rearing Habitat Resulting from Changes in Channel Morphology and Hydraulics Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-6: Short-Term Impairment of Green Sturgeon Passage and Reduced Availability of Holding and Rearing Habitat Resulting from Changes in Channel Morphology and Hydraulics Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-7: Short-Term Impairment of Sacramento Splittail Passage and Reduced Availability of Rearing Habitat Resulting from Changes in Velocity Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-8: Short-Term Impairment of Longfin Smelt Passage and Reduced Availability of Rearing Habitat Resulting from Changes in Velocity Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-9: Temporary Reduction of Delta Smelt Habitat Quantity or Quality through Removal and Destruction of Cover Attributable to Restoration Activities	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
FISH-10: Temporary Reduction of Chinook Salmon Habitat Quantity or Quality through Removal and Destruction of Cover as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-11: Temporary Reduction of Steelhead Habitat Quantity or Quality through Removal and Destruction of Cover as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-12: Temporary Reduction of Green Sturgeon Habitat Quantity or Quality as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-13: Temporary Reduction of Sacramento Splittail Habitat Quantity or Quality through Removal and Destruction of Cover as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-14: Temporary Reduction of Longfin Smelt Habitat Quantity or Quality through Removal and Destruction of Cover as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-15: Improved Fish Habitat Due to Increased Dissolved Oxygen Concentrations in Tidal Channels Attributable to Restoration Activities	A, B, C	Beneficial	None required	–
FISH-16: Salinity–Related Reduction of Delta Smelt Survival, Growth, Movement, or Reproduction Attributable to Restoration Activities	A, B, C	Less than significant	None required	–
FISH-17: Salinity–Related Reduction of Chinook Salmon Survival, Growth, or Movement as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-18: Salinity–Related Reduction of Steelhead Survival, Growth, or Movement as a Result of Restoration Activities	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
FISH-19: Salinity–Related Reduction of Green Sturgeon Survival, Growth, or Movement as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-20: Salinity–Related Reduction of Sacramento Splittail Survival, Growth, Movement, or Reproduction as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-21: Salinity–Related Reduction of Longfin Smelt Survival, Growth, Movement, or Reproduction as a Result of Restoration Activities	A, B, C	Less than significant	None required	–
FISH-22: Disturbance, Injury, or Mortality of Individual Fish Resulting from Work Adjacent to Bodies of Water	A, B, C	Less than significant	None required	–
FISH-23: Change in Fish Species Composition Attributable to Changes in Salinity or Water Quality from Managed or Natural Wetland Modifications	A, B, C	Less than significant	None required	–
FISH-24: Change in Benthic Macroinvertebrate Composition Attributable to Changes in Channel Morphology and Hydraulics as a Result of Tidal Restoration	A, B, C	Less than significant	None required	–
FISH-25: Change in Primary Productivity as a Result of Tidal Restoration	A, B, C	Beneficial	–	–
Managed Wetland Activities Impacts				
FISH-26: Construction-Related Temporary Impairment of Fish Survival, Growth, and Reproduction by Accidental Spills or Runoff of Contaminants (Heavy Metals)	A, B, C	Less than significant	None required	–
FISH-27: Construction-Related Temporary Reduction of Fish Rearing Habitat Quality or Quantity through Increased Input and Mobilization of Sediment	A, B, C	Less than significant	None required	–
FISH-28: Construction-Related Mortality of Fish from Stranding	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
FISH-29: Temporary Reduction of Delta Smelt, Chinook Salmon and Steelhead Habitat Quantity or Quality Attributable to Management Activities	A, B, C	Less than significant	None required	–
FISH-30: Temporary Reduction of Green Sturgeon Habitat Quantity or Quality as a Result of Management Activities	A, B, C	Less than significant	None required	–
FISH-31: Temporary Reduction of Sacramento Splittail Habitat Quantity or Quality as a Result of Management Activities	A, B, C	Less than significant	None required	–
FISH-32: Temporary Reduction of Longfin Smelt Habitat Quantity or Quality as a Result of Management Activities	A, B, C	Less than significant	None required	–
FISH-33: Reduction in Benthic Macroinvertebrate Abundance as a Result of Dredging	A, B, C	Less than significant	None required	–
FISH-34: Disturbance, Injury, or Mortality of Delta Smelt Resulting from Dredging	A, B, C	Less than significant	None required	–
FISH-35: Disturbance, Injury, or Mortality of Chinook Salmon Resulting from Dredging	A, B, C	Less than significant	None required	–
FISH-36: Disturbance, Injury, or Mortality of Steelhead Resulting from Dredging	A, B, C	Less than significant	None required	–
FISH-37: Disturbance, Injury, or Mortality of Green Sturgeon Resulting from Dredging	A, B, C	Less than significant	None required	–
FISH-38: Disturbance, Injury, or Mortality of Sacramento Splittail Resulting from Dredging	A, B, C	Less than significant	None required	–
FISH-39: Disturbance, Injury, or Mortality of Longfin Smelt Resulting from Dredging	A, B, C	Less than significant	None required	–
FISH-40: Reduction of Fish Habitat Quantity or Quality Resulting from Installation of New Riprap on Levees	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
VEGETATION AND WETLANDS				
Restoration Impacts				
VEG-1: Short-Term Loss or Degradation of Tidal Wetlands and Tidal Perennial Aquatic Communities in Slough Channels Downstream of Restoration Sites as a Result of Increased Scour	A, B, C	Less than significant	None required	–
VEG-2: Loss or Degradation of Tidal Wetlands Adjacent to Restoration Sites as a Result of Levee Breaching/Grading	A, B, C	Less than significant	None required	–
VEG-3: Loss of Managed Wetlands as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
VEG-4: Loss of Upland Plant Communities and Associated Seasonal Wetland Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
VEG-5: Spread of Noxious Weeds as a Result of Restoration Construction	A, B, C	Less than significant	None required	–
VEG-6: Loss of Special-Status Plants or Suitable Habitat as Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
VEG-7: Degradation of Native Plant Species and Spread of Invasive Plant Species as a Result of Increased Public Access	A, B, C	Less than significant	None required	–
VEG-8: Loss or Degradation of Tidal Native Plant Species and Spread of Invasive Plant Species as a Result of Tidal Muting	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
VEG-9: Loss of Special-Status Plants or Suitable Habitat as Result of Exterior Levee Activities	A, B, C	Less than significant	None required	–
VEG-10: Loss or Degradation of Wetland Communities and Special-Status Plant Species in Slough Channels as a Result of Channel Dredging	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
VEG-1: Loss or Degradation of Rare Natural Communities and Special-Status Plant Species as a Result of New Fish Screen Facilities	A, B, C	Less than significant	None required	–
VEG-12: Loss or Disturbance of Managed Wetlands as a Result of Activities within Managed Wetlands	A, B, C	Less than significant	None required	–
VEG-13: Loss or Disturbance of Tidal Wetlands or Other Waters of the United States and Special-Status Plant Species as a Result of Placement of New Riprap and Alternative Bank Protection Methods	A, B, C	No impact	–	–
VEG-14: Loss or Disturbance of Wetlands and Special-Status Plant Species as a Result of DWR/Reclamation Facility Maintenance Activities	A, B, C	Less than significant	None required	–
VEG-15: Introduction or Spread of Noxious Weeds as Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILDLIFE				
Restoration Impacts				
WILD-1: Loss or Disturbance of Salt Marsh Harvest Mouse Suitable Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-2: Loss or Disturbance of California Clapper Rail Suitable Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-3: Loss or Disturbance of California Black Rail Suitable Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-4: Loss or Disturbance of Suisun Shrew Suitable Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-5: Loss or Disturbance of California Least Tern Suitable Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
WILD-6: Loss of Suisun Song Sparrow and Salt Marsh Common Yellowthroat Suitable Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-7: Loss or Disturbance of Raptor Nest Sites or Foraging Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-8: Loss or Disturbance of Western Pond Turtle as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-9: Loss or Disturbance of Tricolored Blackbird as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
WILD-10: Effects on Southern Resident Killer Whales as a Result of Changes in Salmon Populations	A, B, C	Less than significant	None required	–
WILD-11: Loss or Disturbance of Waterfowl and Shorebird Habitat as a Result of Tidal Wetland Restoration	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
WILD-12: Loss or Disturbance of Salt Marsh Harvest Mouse Suitable Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-13: Loss or Disturbance of California Clapper Rail Suitable Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-14: Loss or Disturbance of California Black Rail Suitable Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-15: Loss or Disturbance of Suisun Shrew Suitable Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
WILD-16: Loss or Disturbance of California Least Tern Suitable Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-17: Loss or Disturbance of Suisun Song Sparrow and Salt Marsh Common Yellowthroat Suitable Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-18: Loss or Disturbance of Raptor Nest Sites or Foraging Habitat as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-19: Loss or Disturbance of Western Pond Turtle as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-20: Loss or Disturbance of Tricolored Blackbird as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-21: Effects on Southern Resident Killer Whales as a Result of Changes in Salmon Populations as a Result of Managed Wetland Activities	A, B, C	Less than significant	None required	–
WILD-22: Changes in Waterfowl Nesting and Wintering Habitat as a Result of Marsh Management Activities	A, B, C	Beneficial	–	–
WILD-23: Changes in Shorebird Nesting and Wintering Habitat as a Result of Marsh Management Activities	A, B, C	Beneficial	–	–
LAND AND WATER USE				
Restoration Impacts				
LU-1: Alteration of Existing Land Use Patterns	A, B, C	Less than significant	None required	–
LU-2: Conflict with Existing Land Use Plans, Policies, and Regulations	A, B, C	No impact	–	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
LU-3: Conflict with Any Applicable Habitat Conservation Plan or Natural Community Conservation Plan	A, B, C	No impact	–	–
Managed Wetland Activities Impacts				
LU-1: Alteration of Existing Land Use Patterns	A, B, C	Less than significant	None required	–
LU-2: Conflict with Existing Land Use Plans, Policies, and Regulations	A, B, C	No impact	–	–
LU-3: Conflict with Any Applicable Habitat Conservation Plan or Natural Community Conservation Plan	A, B, C	No impact	–	–
SOCIAL AND ECONOMIC CONDITIONS				
Restoration Impacts				
SOC-1: Change in Employment and Income Resulting from Construction, Restoration, and Other Expenditures	A, B, C	Beneficial	–	–
SOC-2: Changes in Employment and Income Resulting from Changes in Managed Wetland–Related Recreation Opportunities and Use	A, B, C	Beneficial	–	–
SOC-3: Changes in Property Tax Revenues as a Result of Purchasing and Restoring Private Lands	A, B, C	Less than significant	–	–
Managed Wetland Activities Impacts				
SOC-1: Change in Employment and Income Resulting from Construction Restoration, and Other Expenditures	A, B, C	Beneficial	–	–
SOC-2: Changes in Employment and Income Resulting from Changes in Managed Wetland–Related Recreation Opportunities and Use	A, B, C	Beneficial	–	–
SOC-4: Changes in Employment and Income Resulting from Increased Expenditures for Wetland Management Activities	A, B, C	Less than significant	–	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
UTILITIES AND PUBLIC SERVICES				
Restoration Impacts				
UTL-1: Damage to Pipelines and/or Disruption of Electrical, Gas, or Other Energy Services during Construction or Restoration Activities	A, B, C	Significant	UTL-MM-1: Relocate Overhead Powerlines or other Utilities that Could be Affected by Construction UTL-MM-2: Avoid Ground-Disturbing Activities within Pipeline Right-of-Way	Less than significant
UTL-2: Damage to Utility Facilities or Disruption to Service as a Result of Restoration	A, B, C	Significant	UTL-MM-3: Relocate or Upgrade Utility Facilities that Could be Damaged by Inundation UTL-MM-4: Test and Repair or Replace Pipelines that Have the Potential for Failure	Less than significant
UTL-3: Reduction in Capacity of Local Solid Waste Landfills	A, B, C	Less than significant	None required	–
UTL-4: Increase in Emergency Service Response Times	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
UTL-3: Reduction in Capacity of Local Solid Waste Landfills	A, B, C	Less than significant	None required	–
UTL-4: Increase in Emergency Service Response Times	A, B, C	Less than significant	None required	–
UTL-5: Damage to Pipelines and/or Disruption of Electrical, Gas, or Other Energy Services during Dredging	A, B, C	Significant	UTL-MM-2: Avoid Ground-Disturbing Activities within Pipeline Right-of-Way	Less than significant
POWER PRODUCTION AND ENERGY				
Restoration Impacts				
POW-1: Substantial Temporary Increase in Energy Use during Construction and Restoration Activities	A, B, C	Less than significant	None required.	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
Managed Wetland Activities Impacts				
POW-2: Substantial Temporary Increase in Energy Use during Managed Wetland Activities	A, B, C	Less than significant	None required.	–
VISUAL/AESTHETIC RESOURCES				
Restoration Impacts				
VIS-1: Temporary Changes in Views Caused by Construction Activities	A, B, C	Less than significant	None required	–
VIS-2: Temporary Changes in Views Caused by Habitat Reestablishment Period	A, B, C	Less than significant	None required	–
VIS-3: Changes in Views to and from Suisun Marsh	A, B, C	Less than significant	None required	–
VIS-4: Damage to Scenic Resources along Scenic Highway	A, B, C	No impact	–	–
VIS-5: Create a New Source of Light and Glare That Affects Views in the Area	A, B, C	Less than significant	None required	–
VIS-6: Conflict with Policies or Goals Related to Visual Resources	A, B, C	No impact	–	–
Managed Wetland Activities Impacts				
VIS-1: Temporary Changes in Views Caused by Construction Activities	A, B, C	Less than significant	None required	–
VIS-3: Changes in Views to and from Suisun Marsh	A, B, C	Less than significant	None required	–
VIS-4: Damage to Scenic Resources along Scenic Highway	A, B, C	No impact	–	–
VIS-5: Create a New Source of Light and Glare That Affects Views in the Area	A, B, C	Less than significant	None required	–

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
VIS-6: Conflict with Policies or Goals Related to Visual Resources	A, B, C	No impact	–	–
CULTURAL RESOURCES				
Restoration Impacts				
CUL-1: Damage to Montezuma Slough Rural Historic Landscape and Mein's Landing as a Result of Ground-Disturbing Activities along Montezuma Slough	A, B, C	Significant	CUL-MM-1: Document and Evaluate the Montezuma Slough Rural Historic Landscape, Assess Impacts, and Implement Mitigation Measures to Lessen Impacts	Significant and unavoidable
CUL-2: Damage to or Destruction of Other Known Cultural Resources as a Result of Ground-Disturbing Activities in Lowland and Marsh Areas	A, B, C	Significant	CUL-MM-2: Evaluate Previously Recorded Cultural Resources and Fence NRHP- and CRHR-Eligible Resources prior to Ground-Disturbing Activities	Less than significant
CUL-3: Damage to Known Cultural Resources as a Result of Inundation	A, B, C	Significant	CUL-MM-3: Protect Known Cultural Resources from Damage Incurred by Inundation through Plan Design (Avoidance) CUL-MM-4: Resolve Adverse Effects prior to Construction	Significant and unavoidable
CUL-4: Inadvertent Damage to or Destruction of As-Yet-Unidentified Cultural Resources as a Result of Ground-Disturbing Activities in Restoration Areas	A, B, C	Significant	CUL-MM-5: Conduct Cultural Resource Inventories and Evaluations and Resolve Any Adverse Effects	Significant and unavoidable
CUL-5: Damage to or Destruction of Human Remains as a Result of Ground-Disturbing Activities	A, B, C	Less than significant	None required	–
Managed Wetland Activities Impacts				
CUL-6: Damage to or Destruction of Shipwrecks or Other Submerged Resources as a Result of Channel Dredging	A, B, C	Significant	CUL-MM-6: Stop Ground-Disturbing Activities, Evaluate the Significance of the Discovery, and Implement Mitigation Measures as Appropriate	Less than significant

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
CUL-7: Damage to or Destruction of Known Cultural Resources Resulting from Managed Wetland Activities	A, B, C	Significant	CUL-MM-7: Complete NHPA Section 106 Consultation and Prepare and Implement Context Study; Evaluate Previously Recorded Cultural Resources and Fence NRHP- and CRHR-Eligible Cultural Resources prior to Ground-Disturbing Activities	Less than significant
CUL-8: Damage to or Destruction of As-Yet-Unidentified Cultural Resources in Uninspected Areas as a Result of Other Ground-Disturbing Managed Wetland Activities	A, B, C	Significant	CUL-MM-8: Complete NHPA Section 106 Consultation and Prepare and Implement Context Study; Conduct Cultural Resources Inventories and Evaluations and Resolve Any Adverse Effects	Significant and unavoidable
PUBLIC HEALTH AND ENVIRONMENTAL HAZARDS				
Restoration Impacts				
HAZ-1: Increased Risk of Mosquito-Borne Diseases	A, B, C	Less than significant	None required	–
HAZ-2: Exposure to or Release of Hazardous Materials during Construction	A, B, C	Less than significant	None required	–
HAZ-3: Release of Hazardous Materials into Surrounding Water Bodies during Construction	A, B, C	Less than significant	None required	–
HAZ-4: In-Channel Construction-Related Increase in Emergency Response Times	A, B, C	Less than significant	None required	–
HAZ-5: Increased Human and Environmental Exposure to Mercury	A, B, C	Less than significant	None required	–
HAZ-6: Reduction in Potential for Catastrophic Flooding	A, B, C	Beneficial	–	–
HAZ-7: Increased Human and Environmental Exposure to Natural Gas and Petroleum	A, B, C	Significant	UTL-MM-2: Avoid Ground-Disturbing Activities within Pipeline Right-of-Way UTL-MM-3: Relocate or Upgrade Utility Facilities That Could Be Damaged by Inundation UTL-MM-4: Test and Repair or Replace Pipelines That Have the Potential for Failure	Less than significant

Impact	Alternative	Significance before Mitigation	Mitigation Measure	Significance after Mitigation
Managed Wetland Activities Impacts				
HAZ-2: Exposure to or Release of Hazardous Materials during Construction	A, B, C	Less than significant	None required	–
HAZ-4: In-Channel Construction-Related Increase in Emergency Response Times	A, B, C	Less than significant	None required	–
HAZ-5: Increased Human and Environmental Exposure to Mercury	A, B, C	Less than significant	None required	–
HAZ-6: Reduction in Potential for Catastrophic Flooding	A, B, C	Beneficial	–	–
ENVIRONMENTAL JUSTICE				
Restoration Impact				
EJ-1: Disproportionate Impact of Management of Suisun Marsh on Minority and/or Low-Income Communities	A, B, C	No impact	–	–
Managed Wetland Activities Impact				
EJ-1: Disproportionate Impact of Management of Suisun Marsh on Minority and/or Low-Income Communities	A, B, C	No impact	–	–
INDIAN TRUST ASSETS				
No Impacts				