DRAFT
The Erosion Repairs of 13 Bank Protection Sites, 2008 and 2009
Sacramento River Bank Protection Project

Sacramento River and Tributaries, California

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ACRONYM LIST

AIRFA	American Indian Religious Freedom Act
ASTM	American Society for Testing and Materials
BMP	best management practice
Cal-IPC	California Invasive Pest Plant Council
Caltrans	California Department of Transportation
CDFG	California Department of Fish and Game
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CHRIS	California Historical Resources Information System
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	carbon monoxide
CRHR	California Register of Historic Resources
CTR	California Toxics Rule
CVFPB	Central Valley Flood Protection Board
CWA	Clean Water Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
dB	decibel
dBA	a-weighted decibel
DBH	diameter at breast height
DD	doubling of distance
DGL	diameter at ground level
DO	dissolved oxygen
DPC	Delta Protection Commission
DPS	distinct population segment
DTSC	Department of Toxic Substance Control

DWR	The California Department of Water Resources
EPCRA	Emergency Planning and Community Right-to-Know Act
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ESA	Federal Endangered Species Act
ESU	evolutionarily significant unit
FRAQMD	Feather River Air Quality Management District
GCAPCD	Glenn County Air Pollution Control District
GIS	geographic information system
GPS	global positioning system
IS	Initial Study
IWM	in-stream woody material
$\mathbf{L_{dn}}$	day-night noise level
$\mathbf{L_{eq}}$	equivalent noise level
$\mathbf{L_{max}}$	maximum noise level
LEP	limited English proficiency
LOS	Levels of Service
MBTA	Migratory Bird Treaty Act
mg/L	milligrams per liter
MSWL	mean summer water level
NACH	Native American Heritage Commission
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
$\mathbf{NO_x}$	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPPA	Native Plant Protection Act

NPT	northwestern pond turtle
NTU	Nephelometric Turbidity Unit
NRHP	National Register of Historic Places
ppt	parts per thousand
PSM	Process Safety Management
RI	recurrence interval
RM	river mile
ROG	Reactive Organic Gas
RQ	reportable quantities
RWQCB	Regional Water Quality Control Board
SAM	Standard Assessment Methodology
SEIR	Supplemental Environmental Impact Report
SEL	single event noise level
SMAQMD	Sacramento Metropolitan Air Quality Management District
SRA	shaded riverine aquatic
SRFCP	Sacramento River Flood Control Project
SRBPP	Sacramento River Bank Protection Project
STAA	Service Transportation Assistance Act
SWPPB	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TMDL	Total Maximum Daily Load
TQ	threshold quantity
TSS	total suspended solids
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VELB	valley elderberry longhorn beetle
WEAP	Worker Environmental Awareness Program
WPCP	Water Pollution Control Program

YSAQMD Yolo-Solano Air Quality Management District

1. PURPOSE AND NEED FOR ACTION

1.1 Proposed Action

The United States Army Corps of Engineers (USACE), Sacramento District, and its local sponsor, the Central Valley Flood Protection Board (CVFPB; formerly the California Reclamation Board) conducts annual field reconnaissance reviews of the Sacramento River Flood Control Project to monitor and identify sites of erosion. Erosion sites are defined for the purpose of this review as sites at risk of failure as the result of erosion during floods and/or normal conditions. Sites are designated as *critical* and *potentially critical* based upon past experience with levees and known mechanics of the particular river.

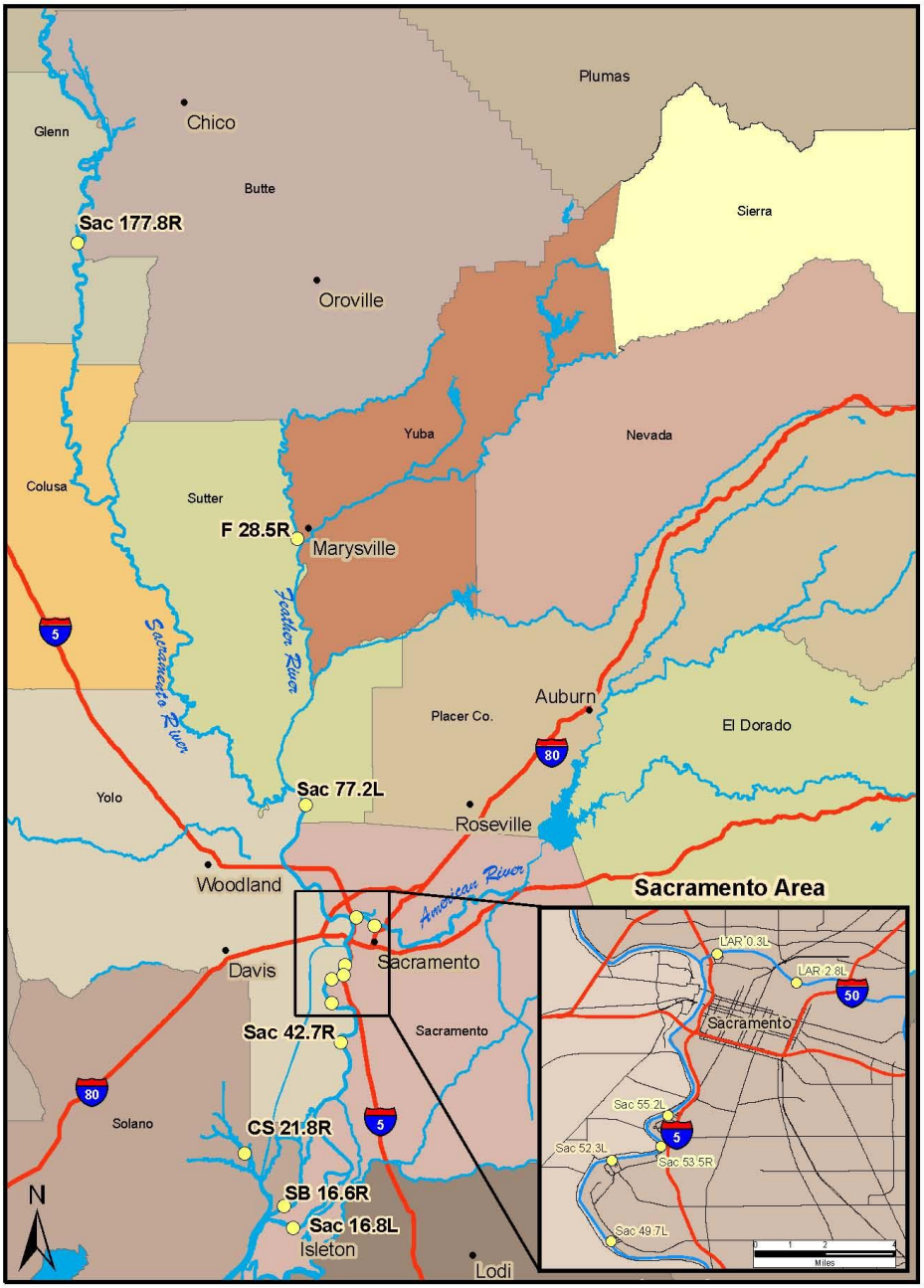
As a result of the 2007 review, USACE and the CVFPB propose to implement bank protection measures to prevent ongoing stream bank erosion at 13 erosion sites along the Sacramento River, Feather River, American River, Cache Slough and Steamboat Slough. Measures would include coverage of the levee slope to the high water mark with a mixture of soil and rock revetment, building toe berms to minimize erosion and enhance slope stability, and installing mitigation plantings. Work would be completed under the authority of the Sacramento River Bank Protection Project (SRBBP), Phase II.

The purpose of the SRBPP to protect from erosion the integrity of the levees and other facilities of the Sacramento River Flood Control Project (SRFCP). The SRFCP was authorized by congress in 1917, and initiated the construction of a comprehensive levee system, overflow weirs, pumping plants, and bypass channels. The critical erosion sites affected by the Proposed Action are federal projects of the SRFCP.

1.2 Project Location

The erosion sites addressed in this document span five counties and most of the Sacramento River watershed. The naming convention for the erosion sites is based upon location, and can be used to locate the sites. Erosion site nomenclature begins with the abbreviation for the water body (see Table 1-1), followed by the approximate distance in river miles (RM) from the mouth of the river, and either “R” or “L” for right or left bank. Bank designations are made “as facing downstream.” Therefore, erosion site Sac 16.8L is located 16.8 miles from the mouth of the Sacramento River, on the left bank as one faces downstream.

The proposed sites evaluated in this Environmental Assessment/Initial Study (EA/IS) are listed in Table 1-1. A location map of the 13 erosion sites is presented as Figure 1-1.



Site Vicinity Map
Figure 1-1

Table 1-1 Erosion Site Locations

Water body	Abbreviation	RM	Bank	County	City
Steamboat Slough	SB	16.6	R	Solano	None
Cache Slough	CS	21.8	R	Solano	None
Sacramento River	Sac	49.7	L	Sacramento	Sacramento
Sacramento River	Sac	52.3	L	Sacramento	Sacramento
Lower American River	LAR	0.3	L	Sacramento	Sacramento
Lower American River	LAR	2.8	L	Sacramento	Sacramento
Sacramento River	Sac	53.5	R	Yolo	West Sacramento
Sacramento River	Sac	177.8	R	Glenn	None
Sacramento River	Sac	16.8	L	Sacramento	None
Sacramento River	Sac	42.7	R	Yolo	None
Sacramento River	Sac	55.2	L	Sacramento	Sacramento
Sacramento River	Sac	77.2	L	Sutter	None
Feather River	F	28.5	R	Sutter	Yuba City

1.3 Background

Under natural conditions the flood plain of the Sacramento River varied from 2 to 30 miles wide, extended about 150 miles along the river and annually covered over 1 million acres. Beginning in the 1840s, low, discontinuous levees were built by individual landowners. Since that time, a variety of levee improvement projects have been implemented to regulate and repair the system.

High winter flows can erode and stress the levees, weakening them and causing them to fail in certain locations. To maintain the integrity of the flood control system, locations with the potential for failure are identified and remedied under the SRBPP. The SRBPP planning area extends from the lower Sacramento River near Collinsville at RM 0 to Chico Landing at RM 194 and includes the lower reaches of the American River (RM 0-23), Feather River (RM 0-61), Yuba River (RM 0-11), and Bear River (RM 0-17), as well as portions of Three Mile, Steamboat, Sutter, Miner, Georgiana, Elk, and Cache sloughs.

Recent bathymetric surveys conducted by Ayres Associates indicate the development of scour holes in the river bed near the toes of the levees in many locations. To fill those scour holes, the project design includes rock fill with riprap toe protection. Riprap and soil berms will also be placed on the upper banks of the levees to protect these areas from further erosion, while maintaining the greatest amount of existing vegetation possible.

1.4 Project Authority

The proposed work is a component of the SRBPP, which was authorized by Congress under the Flood Control Act of 1960, in accordance with the recommendations of the Chief of Engineers (as recorded in Senate Document Number 103, 86th Congress, Second Session, entitled "Sacramento River Flood Control Project, Sacramento" and dated May 26, 1960). The SRBPP is a partnership between federal (USACE) and state (CVFPB) entities.

1.5 Purpose of the EA/IS

The primary purpose of the EA/IS is to determine whether the proposed action would have a significant impact on the environment, requiring the preparation of the Environmental Impact Report/ Environmental Impact Statement (EIR/EIS). This document describes existing environmental resources, evaluates the significance of environmental effects to those resources that will occur due to the proposed work, and, if the effects are determined to be significant, identifies measures that will mitigate the environmental effects. If significant impacts are found to be insignificant after adoption of mitigation measures, then a mitigated finding of no significant impact or negative declaration is appropriate.

The purpose of this EA/IS is to fulfill the permitting requirements of the state and federal agencies that are implementing the project. It tiers from the 1987 Programmatic EIR/Supplemental Environmental Impact Statement (SEIS) IV prepared for the SRBPP, which discusses the environmental impacts associated with bank protection alternatives from Sacramento RM 0 at Collinsville to RM 194 just below Hamilton City (USACE 1987), and the SEIS/EIR V, prepared by Jones and Stokes Associates, for the American River in the area where LAR 0.3L and 2.8l are located.

In addition, the EA/IS will serve as a biological assessment to be provided to the National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (USFWS) for the Section 7 Endangered Species Act (ESA) consultation, including evaluation of effects of the project on listed and sensitive species, critical habitat, and essential fish habitat. . A programmatic biological assessment has been prepared for the SRBPP and Section 7 consultation requests were made to NMFS and USFWS in October 2007, consultation will be completed prior to the need to implement the proposed project by submitting this EA/IS and appending it to the ongoing programmatic consultation.

1.6 Required Decisions

Under the National Environmental Policy Act (NEPA), the Sacramento District Engineer must decide whether the proposed work qualifies for a Finding of No Significant Impact, or if a Supplemental EIS is required. Additionally, the CVFPB determines if the actions qualify for a Mitigated Negative Declaration under the California Environmental Quality Act (CEQA) or, whether an EIR must be prepared.

2. ALTERNATIVES

2.1 No Action Alternative

Under this alternative, no action would be taken to halt erosion and protect the levee at the 13

erosion sites. Forces of erosion would persist, including wave wash, flood flows, and human disturbances. Continued erosion to the levee system would increase the risk of levee failure and possible flooding of surrounding areas. Existing conditions would not be changed as a result of levee repair. However, normal development and agricultural activities would still occur.

Should levee failure result from the No Action Alternative, resultant emergency measures would likely be of a nature that limits the ability of the USACE to properly implement best management practices (BMPs), site-specific mitigation, and other measures that would minimize impacts to aquatic and terrestrial communities.

2.2 Alternative 1: Proposed Action

This alternative proposes the implementation of bank protection measures to prevent ongoing erosion and increase levee stability. A riprap berm would be constructed near the existing levee berm, and the remaining levee slope would be armored with a soil and rock mixture to a height suitable to prevent erosion. The completed site would be planted with native vegetation to mitigate habitat lost through the construction process.

The project would include: repair work; habitat disturbance; construction staging; haul routes and traffic considerations; and maintenance activities. However, no excavation or grubbing would occur. Across all 13 sites, this alternative would use 167,625 cubic yards of riprap rock revetment with an average diameter of 8–10 inches for toe protection. Following bank stabilization, approximately 13,020 cubic yards of soil and sand would be used to establish plantings on the benches and upper banks at the project sites.

2.3 Alternative 2: Thin Rock Armor

This alternative would also include repair work, habitat disturbance, construction staging, haul routes and traffic considerations, and maintenance activities. A thin layer of rock would be placed over the existing, eroded levee slope. The result would protect the bank from erosion, but would not address stability issues. When placed on a slope of 2:1 (horizontal to vertical) or greater, the life span of this type of repair is estimated at approximately 25 years, half that of the preferred alternative. Furthermore, the resulting profile of the erosion sites would limit, and in some cases prevent, the addition of mitigation plantings. Therefore, the sites would remain essentially barren, and mitigation would be arranged at some offsite facility.

2.4 Alternatives Considered But Eliminated From Further Consideration

As a part of the project design process, Ayres prepared an Alternatives Report that addresses various approaches to repair of the erosion sites. Groins and jetties were eliminated from further consideration because they would not address slope stability problems, and might encroach into the hydraulic capacity of the river. Setback levees were considered for all sites. In most cases, land use conflicts precluded further consideration of setback levees. However, the Alternatives Report did identify two erosion sites (Sac 57.2R and Sac 83.9L) that are suitable for setback levees. Since these two sites will not be included in the construction contracts considered in this document, they are subject to site-specific

environmental documents that will be prepared at a later date once their designs are complete.

2.5 Overall Project Features

The project footprint consists of the entire area subject to slope protection. The repairs have been designed to maximize slope stability while retaining the essential features of the channel. At the center of the sites, the revetment profile extends furthest into the river. At either end of this central portion, the "transition" areas pull the profile closer to the existing bank. At the end of the transitions, the revetment is gradually tapered to match the existing bankline. Revetment materials would consist of rock rip-rap below the mean summer water surface (MSWL), and soil filled quarry stone above the MSWL.

Project features, including length, acreage, IWM to be removed and added with construction, and quantities of rip-rap and sand fill and soil cover, are presented as totals by county in Table 2-1. Individual quantities for each site are presented in Tables 2-2 through 2-14.

Approximately 167,208 cubic yards of rock revetment would be placed along 8,040 linear feet of embankment. Approximately 13,870 cubic yards soil and sand fill (mixture of sand and silt suitable for plant growth) would be placed on top of the rock revetment to serve as a planting medium. The total surface area of these materials would be 18.47 acres. Following project completion, the area of this material below MSWL is calculated to 7.85 acres. The quantity of fill and IWM may vary slightly from the estimate due to potential erosion occurring during the flood season prior to construction. Additionally, placement of quantities of IWM at an individual site may vary from what is described above due to safety concerns. Final placement locations shall be determined at the time of construction.

Placement of riprap, the rock/soil mixture, and in-stream woody material (IWM) would be completed during one construction season. Vegetation would be installed and maintained during that same construction season and then maintained for an additional 5 years. Maintenance activities may occur year-round in the overbank and dry areas, but would avoid any elderberry shrubs by 100 feet or another distance coordinated with USFWS. In coordination with federal and state resource agencies, any in-water work needed for maintenance would be conducted during appropriate time periods to avoid adverse effects to fish. The current acceptable in-water work "window" for listed salmonids and delta smelt is July 1 to November 30 in any year. The construction window for waterside work is August 1 through November 30, while the landside work could occur year-round. The USFWS has confirmed that the Section 7 consultation will be completed by June 8, 2008 in time for the Fall 2008 construction date (USFWS Cite TBD). Phase 2 bank revegetation will commence immediately following placement of the revetment and will be completed by June 1, 2009.

Quarry stone and soil-filled quarry stone would be placed around all trees currently present on the erosion sites. Existing trees would be wrapped in a three layer thickness of coir fabric for protection prior to quarry stone placement. Removal and trimming of trees would be minimized to the maximum extent feasible. The contractor would be responsible for determining the exact location of all utilities within the construction zone, along the construction access route, and in the staging areas before commencing work. The contractor would be responsible for repairing any damage caused by the contractor to any irrigation intake or pumping facilities, storm drain pipes, bridges, pavement, roads, fencing, flood

control structures (including levee and bank protection), and other utilities and improvements.

Table 2-1 - Overall Project Features, by County

County	Erosion Site(s)	Total Lineal Feet	Total Acreage	Pre-Repair		Post-Repair		IWM to be Removed (lineal feet)	IWM to be Placed (cubic yards)	Rip-Rap to be Placed (cubic yards)	Soil Mixture to be Placed (cubic yards)
				Acreage Above Water	Acreage Below Water	Acreage Above Water	Acreage Below Water				
Glenn	Sac 177.8R	1,000	1.81	0.45	1.35	0.75	1.06	-	3,161	11,076	370
Sacramento	Sac 49.7L; Sac 52.3L; LAR 0.3L; LAR 2.8L; Sac 16.8L; Sac 55.2L	3,410	7.92	3.07	4.85	5.39	2.52	470	6,861.2	82,169	6,930
Solano	SB 16.6R; CS 21.8R	1,360	2.73	0.88	1.85	1.46	1.26	260	276	20,861	3,070
Sutter	Sac 77.7L; F 28.5R	1,630	3.83	0.80	3.04	1.59	2.25	94	4,669	36,768	2,600
Yolo	Sac 53.5R; Sac 42.7R	640	2.19	0.86	1.33	1.43	0.76	79	1,421	16,752	900
County Totals		**8,040**	**18.47**	**6.06**	**12.42**	**10.63**	**7.85**	**903**	**16,388.2**	**167,626**	**13,870**

The contractor would be responsible for determining the exact location of all utilities within the construction zone, along the construction access route, and in the staging areas before commencing work. The contractor would be responsible for repairing any damage caused by the contractor to any irrigation intake or pumping facilities, storm drain pipes, bridges, pavement, roads, fencing, flood control structures (including levee and bank protection), and other utilities and improvements.

Levee slopes under this contract would not be cut in order to provide construction ramps. If required, temporary construction access ramps would be built down the waterside face of the levee with imported earth materials. When temporary ramps are no longer required, and prior to the flood season (December 1 through April 15), all temporary ramps would be removed and the materials disposed of by the contractor.

Following construction, the sites would be planted following specialized planting schedules for each site. These have been developed to reflect "zones" of water inundation and the surrounding environment. To protect the restoration plantings during the establishment period, beaver fence would be installed roughly at the MSWL (at the toe of the riparian slope), extending to the upstream and downstream limits of the site and up the levee slope.

IWM would be installed at erosion sites below RM 30 only to the extent necessary to replace IWM found at these sites prior to construction. Above this river mile mark, the number of IWM to be installed has been determined through evaluation of the mitigation required for fish habitat. All installed IWM would average 23 feet in length and 10 to 24 inches in diameter at breast height (DBH). IWM would be anchored into the revetment, angled 25 to 35 degrees downstream, in alternating groups of 3 and 5 trees every 5 to 10 feet. Fascine bundles of willow cuttings would be placed at all erosion sites at the MSWL, spaced 15 feet apart, within the quarry stone surface.

2.6 Work at Each Erosion Site

In the case of waterside construction, fill work will be conducted from cranes mounted on barges, with the crane (boom) systems mechanically placing the rock along the shore and beneath the water line. Waterside construction will minimize noise and traffic disturbances, and effects on existing vegetation. The contractor may choose to use excavators, loaders, and other construction equipment once the riprap has reached the MSWL.

Landside construction will take place in those sites where difficulties in accessing the sites from the water. A crane (boom) system located on the levee will mechanically place the rock along the shore and beneath the water line. The contractor may choose to use excavators, loaders, and other construction equipment along the benches on sites that are inappropriate for the crane system and/or once the riprap has reached the MSWL.

As shown in Appendix A, the contractor will use adjacent landside areas for staging of vehicles, plant materials, and other associated construction equipment, as necessary. Protective fencing will be installed to prevent vehicles and construction equipment from getting too close to the waterside edge of the existing bank materials and sensitive resources such as elderberry shrubs.

This section describes proposed work at each erosion site. Cross-sectional views and construction footprints for each site are presented in Appendix A.

2.6.1 Contract 1

Contract 1 would include four sites (SB 16.6R, CS 21.8R, Sac 49.7L, and Sac 52.3L). Construction would occur during summer/fall 2008, and all work will be from the waterside.

2.6.1.1 SB 16.6R

This site would include the creation of both wetland and riparian bench features. The wetland bench would be constructed just below the MSWL, and would consist of quarry stone covered in 2 feet of sand fill mixed into the quarry stone. IWM would be installed along the top of the wetland bench to replace existing IWM quantities removed during construction. The riparian bench would be located above the wetland bench, with soil-filled quarry stone, covered by 0.5 feet of soil, extending from the edge of the riparian bench to the top of the site erosion.

Table 2-2 SB 16.6R General Site Characteristics

Repair Site Characteristics	
Length of repair (feet)	700
Site Area (acres)	1.47
Existing acreage above MSWL	0.56
Existing acreage below MSWL	0.92
Post-project acreage above MSWL	0.84
Post-project acreage below MSWL	0.63
Proposed rip-rap revetment volume (cubic yards)	14,032
Proposed sand and soil cover (cubic yards)	1,380
Proposed final bank slope outside of planted bench areas (H:V)	2:1
Proposed final bank slope within wetland bench (H:V)	10:1
Proposed final bank slope within riparian bench (H:V)	6:1
IWM removed (lineal feet)	42
Proposed IWM placed above MSWL (lineal feet)	46

2.6.1.2 CS 21.8R

The proposed erosion site repairs would include the construction of a wetland bench just below the MSWL that is covered in 2 feet of sand fill and quarry stone mixture. Soil filled quarry stone, topped with 0.5 feet of soil, will extend from the top of the wetland bench to the top of the repair. IWM would be installed along the top of the wetland bench to replace existing IWM quantities removed during construction. The existing pump structure adjacent to the upstream site limits would not be disturbed during construction and would be protected

in place.

Table 2-3 CS 21.8R General Site Characteristics

Repair Site Characteristics	
Length of repair (feet)	1,040
Site Area (acres)	1.26
Existing acreage above MSWL	0.32
Existing acreage below MSWL	0.93
Post-project acreage above MSWL	0.62
Post-project acreage below MSWL	0.63
Proposed rip-rap revetment volume (cubic yards)	6,829
Proposed sand fill and soil cover (cubic yards)	1,690
Proposed final bank slope outside of planted bench areas (H:V)	2:1, 3:1
Proposed final bank slope within wetland bench (H:V)	10:1
IWM removed (lineal feet)	218
Proposed IWM placed above MSWL (lineal feet)	230

2.6.1.3 Sac 49.7L

This site would include an upper slope, riparian bench, and lower slope. The slope of the repair would vary below the MSWL. IWM would be installed along the toe of the riparian bench.

Table 2-4 Sac 49.7L General Site Characteristics

Repair Site Characteristics	
Length of repair (feet)	280
Site area (acres)	1.44
Existing acreage above MSWL	0.60
Existing acreage below MSWL	0.84
Post-project acreage above MSWL	0.95
Post-project acreage below MSWL	0.49
Proposed rip-rap revetment volume (cubic yards)	6,032
Proposed sand fill and soil cover (cubic yards)	320

Repair Site Characteristics	
Proposed final bank slope outside of planted bench areas (H:V)	2:1, 3:1
Proposed final bank slope within riparian bench (H:V)	varies
IWM removed (lineal feet)	90
Proposed IWM placed above MSWL (lineal feet)	696

2.6.1.4 Sac 52.3L

The proposed design of the site includes riparian and wetland benches. A large, gently sloping riparian bench will cover the majority of the site, followed by a brief slope into the wetland bench, which would extend below the MSWL. IWM would be installed along the top of the wetland bench.

Table 2-5 Sac 52.3L General Site Characteristics

Repair Site Characteristics	
Length of repair (feet)	1,320
Site area (acres)	0.62
Existing acreage above MSWL	0.16
Existing acreage below MSWL	0.46
Post-project acreage above MSWL	0.28
Post-project acreage below MSWL	0.33
Proposed rip-rap revetment volume (cubic yards)	25,379
Proposed sand fill and soil cover (cubic yards)	2,760
Proposed final bank slope outside of planted bench areas (H:V)	2:1, 3:1
Proposed final bank slope within wetland bench (H:V)	10:1
Proposed final bank slope within riparian bench (H:V)	10:1
IWM removed (lineal feet)	242
Proposed IWM placed above MSWL (lineal feet)	3,045

2.6.2 Contract 2

Contract 2 will include four sites (LAR 0.3L, LAR 2.8L, Sac 53.5R, and Sac 177.8R). Construction would occur during summer/fall 2008 and work is expected to be entirely from the landside, though some waterside work may be conducted by the contractor.

2.6.2.1 LAR 0.3L

The existing pipe structure that extends from near the levee crest to above the project footprint at the downstream end of the erosion site would not be disturbed during construction. Elderberry shrubs located on this site are located upslope of and within the proposed project footprint, and would be protected onsite.

A riparian bench would be constructed at a height to provide for inundation in the winter and spring, but not during summer and fall. Anchored IWM would be installed at the back of the bench, embedded at the transition to the lower riparian slope.

Table 2-6 LAR 0.3L General Site Characteristics

Repair Site Characteristics	
Length of repair (feet)	520
Site area (acres)	0.75
Existing acreage above MSWL	0.19
Existing acreage below MSWL	0.56
Post-project acreage above MSWL	0.39
Post-project acreage below MSWL	0.36
Proposed rip-rap revetment volume (cubic yards)	6,800
Proposed sand fill and soil cover (cubic yards)	1,110
Proposed final bank slope outside of planted bench areas (H:V)	2.5:1, 3:1
Proposed final bank slope within riparian bench (H:V)	10:1
IWM removed (lineal feet)	12
Proposed IWM placed above MSWL (lineal feet)	1,131

2.6.2.2 LAR 2.8L

This repair would consist of soil filled quarry stone covered with 0.5 feet of soil from the top of the repair to the MSWL, and would include a riparian bench area for mitigation plantings. Similar to site LAR 0.3L, the riparian bench would be constructed at a height to provide for inundation in the winter and spring. Anchored IWM would be installed at the back of the bench, embedded at the transition to the lower riparian slope.

Table 2-7 LAR 2.8L General Site Characteristics

Repair Site Characteristics	
Length of repair (feet)	470
Site area (acres)	3

Repair Site Characteristics	
Existing acreage above MSWL	1.12
Existing acreage below MSWL	1.88
Post-project acreage above MSWL	2.26
Post-project acreage below MSWL	0.74
Proposed rip-rap revetment volume (cubic yards)	12,750
Proposed sand fill and soil cover (cubic yards)	990
Proposed final bank slope outside of planted bench areas (H:V)	2:1, 2.5:1, 3:1
Proposed final bank slope within riparian bench (H:V)	10:1
IWM removed (lineal feet)	26
Proposed IWM placed above MSWL (lineal feet)	81.2

2.6.2.3 Sac 53.5R

This repair would consist of soil filled quarry stone covered with 0.5 feet of soil from the top of the repair to the MSWL, and would include a riparian bench area for mitigation plantings. The existing reinforced concrete box culvert, located above the planned riparian bench midway through the site, would be removed during construction. Elderberry shrubs located near this site are outside of the construction footprint and would be protected. All visible asphalt located within the project limits would be removed. IWM would be installed at the MSWL.

Table 2-8 Sac 53.5R General Site Characteristics

Repair Site Characteristics	
Length of repair (feet)	430
Site area (acres)	1.08
Existing acreage above MSWL	0.45
Existing acreage below MSWL	0.63
Post-project acreage above MSWL	0.76
Post-project acreage below MSWL	0.32
Proposed rip-rap revetment volume (cubic yards)	10,276
Proposed sand fill and soil cover (cubic yards)	650
Proposed final bank slope outside of planted bench areas (H:V)	2:1, 3:1

Repair Site Characteristics	
Proposed final bank slope within riparian bench (H:V)	10:1
IWM removed (lineal feet)	none
Proposed IWM placed above MSWL (lineal feet)	725

2.6.2.4 Sac 177.8R

This site would be built from the land side. To access the entire site, a ramp would be constructed of imported material, which would be removed as the site is completed. The repair of this site would place the majority of the repair rock below the MSWL. There would be a relatively small cap of soil filled quarry stone above this point, and a span of unrepaired levee extending to the levee crest. IWM would be installed at the MSWL.

Table 2-9 Sac 177.8R General Site Characteristics

Repair Site Characteristics	
Length of repair (feet)	1,070
Site area (acres)	1.81
Existing acreage above MSWL	0.46
Existing acreage below MSWL	1.35
Post-project acreage above MSWL	0.75
Post-project acreage below MSWL	1.06
Proposed rip-rap revetment volume (cubic yards)	11,076
Proposed sand fill and soil cover (cubic yards)	370
Proposed final bank slope outside of planted bench areas (H:V)	10:1, 3:1
IWM removed (lineal feet)	none
Proposed IWM placed above MSWL (lineal feet)	3,161

2.6.3 Contract 3

Contract 3 would include the remaining five sites (Sac 16.8L, Sac 42.7R, Sac 55.2L, Sac 77.2L, and F 28.5R). Construction would occur during summer/fall 2009, and work is expected to be entirely from the landside, though some waterside work may be conducted by the contractor.

2.6.3.1 Sac 16.8L

The bank slope above the water surface at this erosion site would be constructed of soil filled quarry stone covered with 0.5 feet of soil and would extend to the top of the existing

bankline. A wetland bench consisting of sand fill mixed with quarry stone 2 feet thick would be constructed on top of the quarry stone comprising the portion of the levee repair below the MSWL surface. IWM would be installed along the top of the wetland bench, in clusters of three trees, to replace existing IWM quatities removed during construction.

Table 2-10 Sac 16.8L General Site Characteristics

Repair Site Characteristics	
Length of repair (feet)	690
Site area (acres)	0.98
Existing acreage above MSWL	0.58
Existing acreage below MSWL	0.40
Post-project acreage above MSWL	0.84
Post-project acreage below MSWL	0.14
Proposed rip-rap revetment volume (cubic yards)	12,463
Proposed sand fill and soil cover (cubic yards)	1,090
Proposed final bank slope outside of planted bench areas (H:V)	2:1, 6:1
Proposed final bank slope within wetland bench (H:V)	10:1
IWM removed (lineal feet)	19
Proposed IWM placed above MSWL (lineal feet)	23

2.6.3.2 Sac 42.7R

The profile of the proposed repair consists of soil filled quarry stone extending from the MSWL to the top of the existing bankline. This area would have a relatively steep upper slope and a flatter riparian bench area. Below the water surface, quarry stone would extend in a uniform slope to the river bed. The existing pilings and pump structure located on this erosion site would be protected in place, and would not be disturbed during construction. IWM would be installed at the MSWL.

Table 2-11 Sac 42.7R General Site Characteristics

Repair Site Characteristics	
Length of repair (feet)	240
Site area (acres)	1.11
Existing acreage above MSWL	0.41

Repair Site Characteristics	
Existing acreage below MSWL	0.70
Post-project acreage above MSWL	0.67
Post-project acreage below MSWL	0.44
Proposed rip-rap revetment volume (cubic yards)	6,476
Proposed sand fill and soil cover (cubic yards)	250
Proposed final bank slope outside of planted bench areas (H:V)	2:1
Proposed final bank slope within riparian bench (H:V)	10:1
IWM removed (lineal feet)	79
Proposed IWM placed above MSWL (lineal feet)	696

2.6.3.3 Sac 55.2L

The repair of this site would begin approximately 80 feet from the levee crest, and would consist of soil covered soil-filled quarry stone to the MSWL. Below the water surface, quarry stone would extend at a consistent slope to the river bed. IWM would be installed at the MSWL.

A fence, which extends from the levee crest to the top of the project footprint near the center of the site, would be protected in place. Also present on the site, between the levee crest and the project footprint, an old telephone pole, concrete pad and hoist, and two existing monitoring wells will be preserved onsite. Two existing sets of stairs and docks would be removed and replaced.

Table 2-12 Sac 55.2L General Site Characteristics

Repair Site Characteristics	
Length of repair (feet)	730
Site area (acres)	1.13
Existing acreage above MSWL	0.42
Existing acreage below MSWL	0.71
Post-project acreage above MSWL	0.67
Post-project acreage below MSWL	0.46
Proposed rip-rap revetment volume (cubic yards)	18,745
Proposed sand fill and soil cover (cubic yards)	660
Proposed final bank slope outside of planted bench areas (H:V)	2:1, 3:1

Repair Site Characteristics	
Proposed final bank slope within riparian bench (H:V)	10:1
IWM removed (lineal feet)	81
Proposed IWM placed above MSWL (lineal feet)	1,885

2.6.3.4 Sac 77.2L

The profile of the proposed repair consists of an upper slope, mildly sloping riparian bench area, and below water slope. The existing pump structure and pilings would not be disturbed during construction. The elderberry shrubs located on this site are above the limit of repair and would be preserved in place. IWM would be installed at the MSWL.

Table 2-13 Sac 77.2L General Site Characteristics

Repair Site Characteristics	
Length of repair (feet)	600
Site area (acres)	2.22
Existing acreage above MSWL	0.61
Existing acreage below MSWL	1.62
Post-project acreage above MSWL	1.15
Post-project acreage below MSWL	1.08
Proposed rip-rap revetment volume (cubic yards)	11,789
Proposed sand fill and soil cover (cubic yards)	600
Proposed final bank slope outside of planted bench areas (H:V)	2:1, 3:1
Proposed final bank slope within riparian bench (H:V)	10:1
IWM removed (lineal feet)	2
Proposed IWM placed above MSWL (lineal feet)	1,131

2.6.3.5 F 28.5R

The proposed repairs will begin approximately 80 feet from the levee crest and will consist of soil-filled quarry stone to create a sloped repair, which would be covered in soil for mitigation planting. A wetland bench area would be created, which would be inundated year-round. Below the water surface, quarry stone will extend at a uniform 2:1 slope. Anchored IWM and fascine bundles would be installed at the back of the bench where the transition occurs to the lower riparian slope.

An existing railroad bridge pier, located up-slope from the upstream transition area, would

not be disturbed during construction. No stone would be placed within 2 feet of the bridge pier, and it would be preserved in place. One elderberry shrub would have to be removed and replanted to complete the proposed repair. Additional elderberry shrubs are located downstream of the site and would not be affected by the project.

Table 2-14 F 28.5R General Site Characteristics

Repair Site Characteristics	
Length of repair (feet)	1260
Site area (acres)	1.61
Existing acreage above MSWL	0.19
Existing acreage below MSWL	1.42
Post-project acreage above MSWL	0.44
Post-project acreage below MSWL	1.17
Proposed rip-rap revetment volume (cubic yards)	24,979
Proposed sand fill and soil cover (cubic yards)	2,000
Proposed final bank slope outside of planted bench areas (H:V)	2:1, 3:1
Proposed final bank slope within wetland bench (H:V)	10:1
IWM removed (lineal feet)	92
Proposed IWM placed above MSWL (lineal feet)	3,538

2.7 Habitat Disturbance

Construction would be conducted in a manner that minimizes disturbance to existing vegetation. The sites would not be grubbed. No excavation or movement of in situ soils or slope protection would occur. Clearing of shrubs, herbaceous vegetation, and trees would be permitted, where unavoidable, only to the minimal extent required to place bank protection material. Efforts would be made to preserve all woody riparian vegetation with a dbh greater than 4 inches. Necessary pruning and trimming, as determined at the time of construction, may be conducted prior to placement of rock slope protection. Disturbed areas, including staging areas, would be seeded and covered with mulch to prevent erosion following project build-out. All construction activities, including pruning and trimming of vegetation, would be supervised by a qualified biologist to ensure a minimal effect on natural resources. It is assumed that a 25% of existing woody vegetation at any one site may potentially be removed to provide construction access. All existing herbaceous and shrubby material within the construction footprint would be covered by rock revetment.

2.8 Construction Staging Areas

Staging areas have been set aside for each erosion site. These areas will be the sole locations

used for staging of vehicles, plant materials, and other associated construction equipment. The staging areas have been subject to the same environmental and cultural review as the project footprint, to ensure that any potential resources will not be adversely affected. Established staging areas for each erosion site are shown in Appendix A.

2.9 Construction Sequencing and Equipment

The contractor will first place revetment from the levee toe up to approximately the MSWL. A layer of biodegradable coir fabric will then be placed on top of the revetment and covered with a layer of rock and soil to create the bench. Rock and soil will then be placed along the upper slopes. The contractor may choose to use excavators, loaders, and other construction equipment once the revetment has reached the MSWL.

Once construction of the bank is completed, the contractor will place soil along the upper banks, and install the IWM and plantings. The upper slope will also be hydroseeded and covered with erosion control measures, to minimize bank erosion before plantings have had time to become established. The contractor may decide to place soil along the entire length of the upper slope and install the plantings, or may construct only a section at a time, depending on material and equipment availability, or feasibility of construction. Willow cuttings and herbaceous vegetation will be installed after construction in the fall, whereas plants in containers may be installed the following spring following seasonal high water. Precise planting timelines will be determined upon the availability of planting materials and in coordination with the NMFS, USFWS, and California Department of Fish and Game (CDFG).

2.10 Haul Routes, Borrow Areas, and Traffic

Depending on the site location, materials would be brought to the sites by either barge (waterside) or via surface roads (landside). Table 2-15 identifies the most likely construction access. Hauling routes to those sites requiring landside access would be via Interstate and United States highways, state highways, and county roads. Construction materials, including rip-rap, would be hauled from a commercial or previously permitted quarry or borrow site located within 100 miles of the site. Temporary lane closures may be required. Construction signs would be posted along the haul routes and flaggers would be used, as necessary, to minimize traffic problems and ensure public safety near the construction sites.

Table 2-15 Construction Access

Erosion Site	Construction Access
Contract 1	
SB 16.6R	Waterside
CS 21.8R	Waterside
Sac 49.7L	Waterside
Sac 52.3L	Waterside
Contract 2	

Erosion Site	Construction Access
LAR 0.3L	Landside
LAR 2.8L	Landside
Sac 53.5R	Water or Landside
Sac 177.8R	Landside
Contract 3	
Sac 16.8L	Water or Landside
Sac 42.7R	Water or Landside
Sac 55.2L	Waterside
Sac 77.2L	Water or Landside
F 28.5R	Water or Landside

2.11 Proposed Mitigation

The following mitigation measures, Table 2-16, will be implemented by the CVFPB to avoid or minimize potential environmental impacts. Implementation of these mitigation measures would reduce the potential environmental impacts of the proposed project to a less-than-significant level.

Table 2-16 Proposed Mitigation Measures

Resource	Significance Thresholds	Mitigation Measures
Land Use	Impact an established community	No Mitigation Required
	Conflict with an applicable land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect set forth by an agency with jurisdiction over any of the erosion sites that together make up the project	No Mitigation Required
Aesthetics	Have a substantial adverse effect on a scenic vista	No Mitigation Required
	Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway	No Mitigation Required
	Substantially degrade the existing visual character or quality of the site and its surroundings	No Mitigation Required
	Create a new source of light or glare that would adversely affect day or nighttime views of the area	No Mitigation Required
Recreation	Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated	No Mitigation Required
	Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment	No Mitigation Required
	Result in a substantial loss of recreational opportunities	Where recreational trial s currently exist, alternative routes and detours shall be provided during construction

Resource	Significance Thresholds	Mitigation Measures
	Substantially increase the risk of injury to the public on, or adjacent to, the proposed repair sites	Signage and/or buoys shall be placed to warn of potential construction hazards. Design shall reduce the risk of entrapment associated with IWM placement and ensure local approach visibility for recreational boaters through the use of natural indicators
Cultural Resources	Cause a substantial adverse change in the significance of a historical or archaeological resource pursuant to CEQA	No Mitigation Required
	Directly or indirectly destroy a unique paleontological resource or site	No mitigation Required
	Disturb any human remains, including those interred outside of formal cemeteries	The County Coroner shall be immediately notified of the finding of any human remains. If the human remains are determined to be prehistoric, the Coroner will notify the Native American Heritage Commission (NAHC), which will determine and notify the most likely descendent. The most likely descendent shall complete a site inspection within 24 hours of notification and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials
	Adversely affect undocumented cultural resources, including human remains	If cultural resources are encountered, work within 100 feet of the find shall be stopped until a qualified archeologist has evaluated the resources. The archeologist will make recommendations in conformance with Public Resources Code 5097.98

Resource	**Significance Thresholds**	**Mitigation Measures**
Vegetation and Wildlife Resources	Interfere with the movement of any resident or migratory wildlife species	A qualified biologist shall conduct a pre-construction breeding-season survey (approximately March through August) of the erosion sites during the same calendar year that construction is planned to begin. Appropriate "no disturbance" buffers shall be established near any identified active nest sites
	Result in the substantial loss, degradation, or fragmentation of any natural plant communities and wildlife habitat	The design of the erosion repair sites would include necessary onsite mitigation. Replacement of existing ruderal habitats with reconstructed riparian plantings using native plant materials within the erosion sites is anticipated to exceed existing habitat values
	Substantially diminish habitat for any fish life stage or result in displacement of spawning fish such that year-class strength is substantially reduced	The retention of existing IWM and the installation of additional IWM would effectively retain and create fisheries habitat and more IWM recruitment and retention during winter and spring flows. In addition, the USACE would prepare a SWPPP that identifies BMPs for potential stormwater discharges
Special Status Species	Adversely affect critical habitat	During construction operations, stockpiling of construction materials, portable equipment, vehicles, and supplies will be restricted to the designated construction staging areas outside of any environmentally sensitive areas

Resource	Significance Thresholds	Mitigation Measures
	Result in an unmitigated take of a special-status species	USACE shall compensate for the shrubs according to the USFWS 1999 *Conservation Guidelines* for the VELB. The USACE will transplant all impacted shrubs and/or compensated for them at a conservation mitigation bank approved by the USFWS. Timing and transplant techniques will follow USFWS 1999 *Conservation Guidelines*. A qualified biologist (monitor) will be on-site for the duration of any transplanting of elderberry plants to ensure that no unauthorized take of the VELB occurs. If unauthorized take occurs, the monitor shall have the authority to stop work until corrective measures have been completed. The monitor will then immediately report any unauthorized take of the beetle or its habitat to the USFWS and to the CDFG.

Resource	Significance Thresholds	Mitigation Measures
	Adversely affect a special-status species	A qualified biologist will provide Worker Environmental Awareness Program (WEAP) training to contractors and construction crews regarding all special status species known to occur on the erosion sites, including the status of the elderberry beetle, its relationship with its host plant, the need to avoid damaging elderberry shrubs, and the possible penalties for not complying with these requirements. In the event that a previously unidentified nesting or roosting Swainson's hawks and other raptors are identified within any of the erosion sites, the USACE will coordinate with the CDFG to identify appropriate measures to ensure that these raptors are not adversely affected. In addition to the mitigation measures included as part of the project work schedule and design, and those implemented as part of the SWPPP, off-site mitigation would be implemented to compensate for long-term losses of nearshore aquatic and riparian habitat values for special status fish. If a northwestern pond turtle is discovered on any of the erosion sites, work shall cease until either (1) the turtle leaves the site of its own volition or (2) a qualified biologist is contacted to relocate the turtle to a suitable downstream location. If special-status plants are identified during floristic surveys, their locations shall be marked by GPS technology. During construction activities, efforts will be made to avoid direct impacts on any special-status plant species. If impacts to those species cannot be avoided, a qualified botanist shall be present to oversee transplantation of any special-status plant, which will be moved to a temporary nursery site until such time that the plant can eventually be replanted at the impacted erosion site, following construction

Resource	**Significance Thresholds**	**Mitigation Measures**
Hydrology and Water Quality	Alteration in the quantity and quality of surface runoff	The contractor shall develop and implement a hazardous materials management plan prior to initiation of construction which includes BMPs to reduce the likelihood of spills of toxic chemicals and other hazardous materials during construction. A SWPPP would be implemented during and after construction to minimize turbidity-generating activities
	Degradation of water quality	A 404(b) 1 analysis for the project under the CWA and water quality certification application shall be completed for the project
	Violation of any water quality standards or waste discharge requirements	Contractors shall also obtain and comply with the conditions of a state General Construction Activity Stormwater Permit adopted by the California State Water Resources Control Board
	Substantial alteration of the existing drainage pattern of the site of area, such that flood risk and/or erosion and siltation potential would increase	No Mitigation Required
	Placement of structures that would impede or redirect flood flows within a 100 year flood plain	No Mitigation Required
	Exposure of people, structures, or facilities to significant risk from flooding, including flooding as a result of the failure of a levee or dam	No Mitigation Required
	Creation or contribution to runoff that would exceed the capacity of an existing or planned stormwater management system	No Mitigation Required

Resource	**Significance Thresholds**	**Mitigation Measures**
	Reduction in groundwater quantity or quality	No Mitigation Required
Geomorphology	Alteration in channel erosion and migration processes	Channel cross-sectional monitoring is recommended in the vicinity of a limited population of the bank protection sites in order to assess potential scour, as well as inform future repair projects.
	Changes in the local hydraulics	Channel cross-sectional monitoring is recommended in the vicinity of a limited population of the bank protection sites in order to assess potential scour, as well as inform future repair projects
	Loss of sediment supply	No Mitigation Required
	Loss of IWM loading and recruitment	Erosion sites at Sac 16.8L, CS 21.8R; and SB 16.6R will not be constructed with additional IWM due to aquatic habitat concerns, but IWM will be mitigated for at these sites by placing additional IWM at other sites

Resource	**Significance Thresholds**	**Mitigation Measures**
Air Quality	Violate applicable air quality standards	Standard construction practices at the erosion sites would ensure that exhaust emissions from all off-road diesel-powered equipment used on the sites do not exceed 40 % opacity for more than 3 minutes in any 1 hour. Additional BMPs would be implemented for O_3 and PM_{10} to help protect ambient air quality conditions. The contractor would also monitor dust conditions along access roads and within the construction area to ensure that the generation of fugitive dust is minimized below the 50 ug/m^3 24-hour threshold and soil-disturbing activities would be suspended during periods with winds over 25 miles per hour. The project applicant or representative shall provide a plan for approval by SMAQMD (Sac 49.7L, Sac 52.3L, LAR 0.3L, LAR 2.8L, Sac 16.8L, Sac 55.2L, and Sac 77.2L), YSAQMD (SB 16.6R, CS 21.8R, Sac 53.5R, and Sac 42.7R), FRAQMD (F 28.5R), GCAPCD (Sac 177.8R), the CVFPB, and the USACE demonstrating that the erosion sites will not exceed 85 lbs/day of NO_x (Sac 49.7L, Sac 52.3L, LAR 0.3L, LAR 2.8L, Sac 16.8L, Sac 55.2L, and Sac 77.2L), 82 lbs/day of NO_x (SB 16.6R, CS21.8R, Sac 53.5R, and Sac 42.7R), 25 lbs/day of NO_x (F 28.5R), and 25 lbs/day of NO_x (Sac 177.8R)

Resource	Significance Thresholds	Mitigation Measures
	Contribute substantially to an existing or projected air quality violation	The USACE and CVFPB shall pay the appropriate local air quality agency an off-site mitigation fee based on the incremental significant emissions at a rate of $14,300/ton (or other negotiated amount) of NO_x, and that the fee would be paid to the agency prior to beginning construction
	Expose sensitive receptors to substantial pollutant concentrations	No Mitigation Required
Traffic	Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system	The construction contractor shall prepare a traffic management plan to be implemented during construction and monitored by the USACE.
	Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads and highways	The construction contractor shall prepare a traffic management plan to be implemented during construction and monitored by the USACE. Construction vehicles that meet the STAA definition of heavy freight vehicles, as found in the California State Vehicle Code, would be required to follow established truck routes to the greatest extent possible
	Result in a change in traffic patterns, including either an increase in traffic levels or a change in location, that results in substantial safety risks	The construction contractor shall prepare a traffic management plan to be implemented during construction and monitored by the USACE.
	Result in inadequate parking capacity	No Mitigation Required
Noise	Noise levels are generated in excess of standards established by local general plans or noise ordinances, or applicable standards of other agencies	For sites within the City of Sacramento, an application for variance shall be filed with the zoning administrator

Resource	Significance Thresholds	Mitigation Measures
	Excessive ground-borne vibration or noise are generated	Construction timing or sequence shall be adjusted to avoid sensitive times of the day.
	A substantial permanent increase in ambient noise levels in the vicinity of the project, above levels existing without the project, results	No Mitigation Required
	A substantial temporary or periodic increase in ambient noise levels in the project vicinity, relative to levels existing without the project, results	Residential areas shall be avoided when planning haul truck routes. To the extent feasible, the contractor shall use newer construction equipment or retrofit older equipment to make it as unobtrusive as possible (i.e. adding mufflers on engines). Construction timing or sequence shall be adjusted to avoid sensitive times of the day, and noise producing operations shall be combined to occur in the same time period. The total noise level produced will not be significantly greater than the level produced if the operations were performed separately.
Hazardous, Toxic, and Radioactive	Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials	No Mitigation Required

Resource	**Significance Thresholds**	**Mitigation Measures**
Waste	Create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials into the environment	The construction contractor shall be required to prepare a Hazardous Material Control and Response Plan prior to construction. The possibility exists that fuels, lubricants and other construction materials could be released on the erosion sites during construction activities. If any undocumented hazardous waste is discovered during construction activities, construction shall stop and the proper local authorities shall be notified
	Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment	No Mitigation Required
Socioeconomics	Induce substantial population growth in an area, either directly or indirectly	No Mitigation Required
	Foster economic or population growth, or the construction of additional housing, either directly or indirectly	No Mitigation Required
	Remove obstacles to population growth	No Mitigation Required
	Encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively	No Mitigation Required

2.12 Off-Site Mitigation

Any elderberry affected by the construction process would be mitigated for off-site, as outlined in Section 4.6. In addition, off-site compensation credits will be purchased or developed for anticipated effects on Central Valley spring-run Chinook salmon, winter-run Chinook salmon, Central Valley steelhead, and delta smelt. Air quality credits will also be purchased or developed for anticipated effects on air quality, as outlined in Section 4.9.

2.13 Mitigation Monitoring Plan

Section 1 of the California Water Code requires that the Resource Agency report to the legislature specific information regarding flood control projects, including the number of acres of riparian, wildlife, and fisheries habitat and the number of lineal feet of shaded riverine aquatic (SRA) habitat disturbed by projects. The section also establishes that the DFG would be responsible for the oversight of all mitigation requirements.

Monitoring is necessary to ensure that the refurbished levees function as the designers intend. The USACE shall, within 90 days of the completion of construction, submit a detailed, site-specific monitoring plan for resource agency review. The monitoring plan would include, at a minimum, (1) mitigation success criteria that provide standards to assess whether the mitigation efforts successfully replace lost habitat; (2) a program to monitor development of significant shaded riverine habitat; and (3) a protocol for implementing remedial actions should any success criteria not be met. Once reviewed, this monitoring plan would be incorporated into an Operations and Maintenance Manual and be implemented at the 13 erosion sites.

To evaluate the site's progress in meeting the mitigation success criteria, annual monitoring reports would be submitted to the resource agencies by December 31 of each year. Monitoring would be conducted until the projected benefits of mitigation actions to federally listed fish species are either substantially confirmed or discounted.

2.14 Maintenance Activities and Work Windows

Limited maintenance would be required for an estimated 3 to 5 years following the completion of the erosion repairs. Once established, the riparian vegetation is expected to be self-maintaining. Anticipated maintenance activities during this initial establishment period include: removal of invasive vegetation determined to be detrimental to the success of the project, pruning and watering of planted vegetation to promote optimal growth, replacement of planted vegetation, maintenance of beaver exclusion fencing, monitoring navigable hazards, and replacement of fill and rock revetment if the site is damaged during high flow events or vandalism.

Yearly maintenance at each site should require the placement of no more than 600 cubic yards of material. Should greater than this estimated volume be required in a year, the necessary permits would be obtained from the regulatory agencies by the agency charged with operations and maintenance of the site. Any maintenance work to be done in-water would be conducted in coordination with the applicable federal and state resource agencies to avoid adverse effects on fish. The "window" in which it is currently acceptable to work in-water without assuming harm to listed salmonids and delta smelt is July 1 to November 30.

2.15 Construction and Maintenance Scheduling

The sites in Contracts 1 and 2 would be constructed in the summer and fall of 2008, while the sites in Contract 3 would be constructed at a later date due to the presence of pumps and encroachment issues that cannot be resolved quickly. In-water construction would be restricted to the period of August 1st to November 30th.

3. RESOURCES ELIMINATED FROM DETAILED ANALYSIS

The erosion sites were evaluated for the potential to significantly affect environmental resources. Based on this analysis, the following resources determined to be unaffected and were subsequently eliminated from detailed analysis.

3.1 Climate

The proposed project would repair the existing levee structures at 13 points along the Sacramento River and its tributaries. All activities with the potential to emit airborne contaminants associated with climate change would be restricted to the relatively brief construction window. This project would not result in any changes to climate; therefore, climate is not discussed in this document.

4. RESOURCES ANALYZED IN DETAIL FOR POTENTIAL EFFECTS

4.1 Land Use

The levees that comprise the erosion sites are existing structures, built to contain the Sacramento River, and its tributaries, and prevent flooding. The proposed erosion repair work would not result in the any new levee development, or the transference of any land uses. All repair work would occur on the waterside of the levee and extend toward the levee crest only as far as necessary to prevent continued erosion.

4.1.1 Environmental Setting

Land uses in the Sacramento River Basin are principally agricultural, silviculture, and open space, with urban development centered around the City of Sacramento and other communities, including Vacaville, Dixon, and Yuba City. More than half the region's population lives in the greater metropolitan Sacramento area. Agriculture is the dominant land use on the valley floor, followed by urban development (CVWQC 2004).

Levees serve as a buffer between a waterway and surrounding land uses. Although often zoned congruent with surrounding zoning, the main purpose of the levee remains protection of the neighboring area from flooding, and as a result the practical land use of most levee sites does not fulfill the possible development scenarios set forth by the land's corresponding zoning designations. The levees in the SRBPP vary in specific land use, but are generally vacant properties that support wildlife habitat, recreation, and aesthetic resources. Below, Table 4-1 summarizes current and surrounding zoning of the erosion sites.

Table 4-1 Erosion Site Zoning and Surrounding Zoning Designations

Erosion Site	Zoning	Surrounding Zoning
SB 16.6R	Agricultural (A-80)	Agriculture (A-80)
CS 21.8R	Agricultural (A-80)	Agriculture (A-80)
F 28.5R	Open space, Flood District (F)	Open space, F, Community Commercial District, (C-2SP)
LAR 0.3L	American River Parkway (ARP-F)	ARP-F, Highway Commercial (HC)
LAR 2.8L	American River Parkway (ARP-F)	ARP-F, Industrial(M-1)
Sac 16.8L	Agricultural (AG-20), Flood zone (F) and Delta Waterway (DW)	Agricultural (AG-20), Flood zone (F) and Delta Waterway (DW)
Sac 42.7R	Heavy Industrial (M-2)	Heavy Industrial (M-2)
Sac 49.7L	Low Density Residential (R-1)	Low Density Residential (R-1)
Sac 52.3L	Low Density Residential (R-1)	Low Density Residential (R-1)
Sac 53.5R	Public Open Space (POS)	Public Open Space (POS)
Sac 55.2L	Low Density Residential (R-1)	Low Density Residential (R-1)l
Sac 57.2R	Public Open Space (POS), Water Front (WF)	Commercial Water related (CW), Recreation Park (RP), Public Open Space (POS), Water Front (WF)
Sac 77.2L	Agriculture (AG)	Agriculture (AG)
Sac 83.9R	Agriculture (AG)	Agriculture (AG)
Sac 177.8R	Exclusive Agriculture (AE)	Exclusive Agriculture (AE)

4.1.2 Regulatory Setting

4.1.2.1 Federal and State Laws and Regulations

California Water Code

Under Title 23 of the California Water Code, the CVFPB regulates any encroachments within an adopted plan of flood control and sets permissible work periods for regulated streams, including the excavation, borrow, and vegetation removal activities within the channel.

The Delta Protection Act of 1992

The Delta Protection Act of 1992 established the Delta Protection Commission (DPC). DPC is a state agency with jurisdiction over the Primary Zone of the Delta. Three of the erosion sites (SB16.6R, CS 21.8R, and Sac 42.7R) are located in the Primary Zone of the Delta. DPC is charged with the task of preparing a regional plan to address land uses and resource management for the Delta area. Key land uses identified in the legislation include agriculture, wildlife habitat, and recreation.

DPC adopted its *Land Use and Resource Management Plan for the Primary Zone of the Delta* on February 23, 1995. The plan was forwarded to the five counties for incorporation into their general plans and zoning ordinances. The counties will then carry out the plan through their day-to-day activities.

Farmland Protection Policy (U.S. Code Title 7, Chapter 23)

The purpose of this regulation is to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses, and to assure that federal programs are administered in a manner that, to the extent practicable, will be compatible with State, unit of local government, and private programs and policies to protect farmland.

State Lands Commission

The State Lands Commission has exclusive jurisdiction over all ungranted tidelands and submerged lands owned by the state and the beds of navigable rivers, sloughs, and lakes. They can only be used for public purposes consistent with provisions of the Public Trust such as fishing, water-dependent commerce and navigation, ecological preservation and scientific study. A project cannot use these state lands unless a lease is first obtained from the State Lands Commission.

The SRBPP has a master lease (PRC 7203.9), which was approved by the commission on May 16, 1988, for bank protection work. Each new bank protection project requires an amendment to this lease.

4.1.2.2 Local Laws and Regulations

Two primary local regulations have jurisdiction over the erosion sites: the applicable General Plan and Zoning Ordinance. A general plan is implemented by the city or county zoning ordinance (which establishes specific development standards and regulations) and other adopted plans and regulations for land use. In some instances a separate land use guide is implemented in areas with special land uses, such as the American River Parkway. Current local land use regulations are identified in Table 4-2, and summarized below.

Table 4-2 Local Land Use Regulations

Erosion Site	Land Use Documents
SB 16.6R	Solano County General Plan
CS 21.8R	Solano County General Plan
Sac 49.7L	City of Sacramento General Plan

Erosion Site	Land Use Documents
Sac 52.3L	City of Sacramento General Plan
LAR 0.3L	City of Sacramento General Plan; American River Parkway Plan
LAR 2.8L	City of Sacramento General Plan; American River Parkway Plan
Sac 53.5R	City of West Sacramento General Plan
Sac 177.8R	Glenn County General Plan
Sac 16.8L	Sacramento County General Plan
Sac 42.7R	Yolo County General Plan
Sac 55.2L	City of Sacramento General Plan
Sac 77.2L	Sutter County General Plan
F 28.5R	Yuba City General Plan; Feather River Parkway Strategic Plan

American River Parkway Plan

The American River Parkway Preservation Act was adopted in 1985 by the California Legislature. The policy document is intended to guide land use decisions to preserve the Parkway's unique natural environment while facilitating human enjoyment of the Parkway. It includes goals and policies oriented primarily for recreation, land use and public safety within the parkway and is an element of the general plans of both the City and the County of Sacramento. Two erosion sites (LAR 0.3L and LAR 2.8L) are located within the American River Parkway.

City of Sacramento General Plan

The City of Sacramento General Plan was adopted by the City Council in 1988. The Land Use Element of the General Plan provides a framework for land use in Sacramento.

Three erosion sites are located in the City of Sacramento (Sac 49.7L, 52.3L, and 55.2L). The sites are designated low density residential. According to the City of Sacramento General Plan, the low density residential designation allows residential land uses with densities from 4 to 15 dwelling units per net acre. Typical development in these areas will consist of single-family detached units, duplexes, halfplexes, townhouses, condominiums, zero lot line units and cluster houses.

City of West Sacramento General Plan

The City of West Sacramento's General Plan was adopted by the City Council in 1990, and was revised in 2004. The Land Use Element of the General Plan provides a framework for land use in West Sacramento. Sac 53.5R is located in the City of West Sacramento, and is currently zoned public open space. According to the City of West Sacramento's General Plan, land uses within the city shall be consistent with the zoning.

City of Yuba City General Plan

The City of Yuba City's General Plan was adopted by the City Council in 2004. The erosion site located in Yuba City, F 28.5R, is located in the Feather River Parkway and has a land use designation of "*Parks, Recreation and Open Space.*" This designation regulates improved and unimproved park facilities, including neighborhood, community, and regional parks; golf courses; and private recreational facilities.

Feather River Parkway Strategic Plan

Developed by Yuba City, this comprehensive strategic plan establishes a framework for improvements to lands on the western bank of the Feather River. The waterfront area of the Feather River currently has a large amount of undeveloped open space that is part of the flood plain, and is visually inaccessible due to the existing levee. The plan presents a framework of uses for these areas. Proposed land uses include a trail system, beaches, river viewing pavilions, boating facilities, and active recreational facilities, such as a golf course. The Feather River Parkway Strategic Plan has been designed in a manner flexible enough to accommodate a variety of activities.

Glenn County General Plan

The Glenn County General Plan was updated by the Board of Supervisors in 2003. The Land Use chapter of the General Plan identifies policies for the distribution and intensity of land uses in the county.

One erosion site (Sac 177.8R) is located in Glenn County, in an area designated Open Space/Public Land. According to the Glenn County General Plan, the Open Space/Public Land designation pertains to land areas having open space value as primitive or natural areas; areas in public ownership which are reserved for wilderness use or as a wildlife or nature preserve; lands in a natural or undisturbed state; lake recreation areas; and areas used for active or passive public recreation purposes.

Sacramento County General Plan

The Sacramento County General Plan was adopted by the Board of Supervisors in 1993 and revised in 2007. According to the Sacramento County General Plan, the erosion site in the unincorporated area of Sacramento County, Sac 16.8L, is designated as open space. Sacramento County's General Plan goals and objectives include preserving open space.

Solano County General Plan

The Solano County General Plan was last updated by the Board of Supervisors in 2005, and is in the process of an additional update scheduled for summer of 2008. The Agricultural chapter of the General Plan identifies agricultural goals to ensure the long-term protection of agricultural opportunities in the county through recognition of these economic, environmental, and social equity benefits (Solano County 2008). Two erosion control sites (SB 16.6R and CS 21.8R) are located in an agriculture zone and surrounded by agricultural land use; however, no agriculture activities are being performed on the erosion sites.

A resource management designation is implemented by the General Plan, which recognizes the presence of certain important natural resources in the county while maintaining the validity of underlying land use designations. This designation covers both of the Solano County erosion sites, protecting resources by (1) requiring study of potential effects if

development is proposed in these locations, and (2) providing mitigation to support urban development in cities. Conservation measures used to achieve the County's resource goals vary based on the targeted resource. Removal of a Resource Conservation designation from a subject property may be possible through a General Plan amendment.

Sutter County General Plan

Sutter County's General Plan was updated by the Board of Supervisors in 1996. According to the Sutter County General Plan, erosion site Sac 77.2L, located in an unincorporated area of the county, is designated as open space. This designation is intended to protect important open space lands within Sutter County, including: non-agricultural areas which contain significant vegetation, wildlife, and/or habitat resources; areas which present conditions hazardous to rural and urban development; and, areas required for the managed production of mineral resources.

Yolo County General Plan

Yolo County is revising its general plan , with a draft available in the summer of 2008. Until the new General Plan is accepted, Yolo County continues to refer to the General Plan dated July 1983. The General Plan identifies goals, policies, and programs representative of the direction of the growth desired by the community. The Land Use chapter of the General Plan identifies policies for the distribution and intensity of land uses in the county.

Sac 42.7R is designated as Open Space by Yolo County's General Plan. According to the Yolo County General Plan, Open Space land is any parcel or area of land or water which is essentially unimproved and devoted to an open space including levees, drainage ways, streams, and river front, designated scenic areas, and wildlife areas.

4.1.3 Environmental Effects

Impacts would be considered significant if the project would:

- Impact an established community; or
- Conflict with an applicable land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect set forth by an agency with jurisdiction over any of the erosion sites that together make up the project.

4.1.3.1 Alternative 1: Proposed Action

The proposed action would repair the erosion sites by creating a rock berm at the base of the levee and covering the remainder of the eroded slope with a soil and rock mixture. This alternative is preferred because it would not only prevent erosion, but also stabilize the levees and allow ample room for re-vegetation.

Upon project completion, land use would remain the same as that identified prior to construction. Within 5 years, it is expected that the restoration plantings would have colonized the site, providing a habitat of native plants that in many cases may exceed the quality of what was there prior to repair. Additionally, the surrounding land uses would be significantly better protected from the threat of a flood.

The proposed action would not impact an established community or conflict with any applicable land use regulations. Therefore, the proposed action would have a less-than-

significant impact.

4.1.3.2 Alternative 2: Thin Rock Armor

This alternative would place a thin layer of rock revetment on the erosion sites. Potential impacts to land use may occur, as the resulting slope of the repair would, in many cases, preclude onsite restoration planting. Where there is no onsite restoration, the value of land under such designations as "Open Space" may be temporarily affected. These areas would eventually experience re-colonization, and no permanent effects to land use are anticipated.

4.1.3.3 Alternative 3: No Action

The No Action Alternative would not affect land use on the levee, or conflict with any land use policy, plan, or regulation. Unrepaired erosion sites, however, could potentially impact established communities during a flood event.

4.1.4 Mitigation

Repair of the erosion sites would not result in any changes in the land use of the sites or adjacent lands. Habitat values would be restored through planned re-vegetation practices, thereby preserving *de facto* uses of the sites in addition to maintaining required characteristics. Therefore, no mitigation is required.

4.2 Aesthetics

The aesthetic value of an area is a measure of the character and quality of the visual resource, combined with viewer response to these conditions. An impact to aesthetic resources occurs when there are changes in viewer response as a result of project construction or operation.

The methods for determining the value of aesthetic resources are based on scenic attractiveness and integrity, landscape visibility, and regional concern levels. Scenic attractiveness is a measure of the landscape's uniqueness including landform, vegetation patterns, water characteristics, and cultural features. Landscape visibility is determined relative to the importance and sensitivity of the area, as determined through consideration of travel ways (linear zones that concentrate public viewing), use areas (points of concentrated public viewing), concern levels, and distance zones. Concern levels can be ascertained through analysis of the public interest in scenery, the regional and national importance of the location, and the use of the site.

The aesthetic values of the erosion sites were assessed during site visits conducted by Parus Consulting in January of 2008. These existing conditions are compared to the anticipated change in the visual character of the erosion sites for the purpose of evaluating the potential impacts to visual resources associated with the proposed erosion repairs.

4.2.1 Environmental Setting

Site photographs are presented in Appendix B. A summary of the aesthetic value of each of the erosion sites is provided in Table 4-3.

Table 4-3 Erosion Site Current Aesthetic Value

Erosion Site	Scenic Attractiveness	Landscape Visibility	Concern Level	Current Aesthetic Value
SB 16.6R	Moderate	Moderate	Moderate	Moderate
CS 21.8R	Moderate	Low	Low	Low
Sac 49.7L	High	High	High	High
Sac 52.3L	High	High	High	High
LAR 0.3L	Moderate	Moderate	High	High
LAR 2.8L	Low	Low	Low	Low
Sac 53.5R	Low	Low	Low	Low
Sac 177.8R	Moderate	High	Moderate	High
Sac 16.8L	Low	Moderate	Moderate	Moderate
Sac 42.7R	Low	Low	Low	Low
Sac 55.2 L	Moderate	High	High	High
Sac 77.2L	Moderate	Moderate	Moderate	Moderate
F 28.5R	High	Moderate	High	High

4.2.1.1 SB 16.6R

Erosion site SB16.6R is located in an agricultural area and is not frequently used by the public. Vegetation on the site is primarily ruderal (57%) and riparian scrub (28%). There are 15 trees on site with a DBH exceeding four inches. Primary views of the site are from the road on the levee crest of the opposite bank of the slough, Grand Island Road. Here, the primary land use is also agriculture. Views of the erosion site are limited by the speed at which motorists travel on Grand Island Road, and the distance across the slough.

Boat traffic also has open viewing of the site. The site is located approximately one mile downstream of a private freshwater marina operated by Snug Harbor Resorts (Snug Harbor Resorts 2008). A second marina is located approximately one mile downstream of the site.

4.2.1.2 CS 21.8R

Erosion Site CS 21.8R is not in an area of frequent public viewing. It is located in Hastings Hunting Preserve, which is open to hunters and those that farm the land only. The patrol road on the levee crest provides views of the gently sloping erosion site, which is covered in low, ruderal vegetation without trees. The land on the inland side of the bank is used for agriculture, and is not likely to provide views of the site.

4.2.1.3 Sac 49.7L

Sac 49.7L is located in the Pocket area of Sacramento. Northeast of the site, on the land side of the levee, are many single family homes. Many of these residences face the levee in the area of the erosion site, and access from the residential street to the erosion site is open. View is limited by the height of the berm, which allows only views of the treetops associated with the site at street level. It is possible, however, that the second story of some of the homes provides views of the erosion site. The site is also easily viewed by the extensive boating traffic in this section of the Sacramento River.

The land on the other side of the river is in agricultural production and likely provides fewer viewing opportunities. South River Road, which generally runs the length of the right side of the river in this area, is set back from the water across from Sac 49.7L. In this area, a large stand of riparian forest shields views of the erosion site from South River Road.

4.2.1.4 Sac 52.3L

The erosion site is bordered on the landside by single family homes, and is located in an area that experiences heavy use by recreational boaters. The vegetative cover on the site consists of cottonwood-dominated riparian forest and ruderal habitat. The area has experienced some disturbance, as cobble rock revetment is already in place at both the upstream and downstream limits of the site and a pump inlet valve is located onsite.

The site is easily viewed from the trail that runs the levee crest, the body of the Sacramento River itself, and South River Road, which runs though the agricultural land along the levee crest of the right bank of the river.

4.2.1.5 LAR 0.3L

LAR 0.3L is covered in ruderal and riparian habitats. Ninety-five trees are located on the site. The patrol road on the levee crest is used for recreation, and the site itself is used for such activities as fishing and swimming. Discovery Park is located on the opposite bank of the American River, and affords many opportunities for recreationalists to view the site. Office buildings are located on the south side of the levee, and Interstate 5, which runs roughly north to south downstream of the site, may provide viewing opportunities.

4.2.1.6 LAR2.8L

This site, which is dominated by low growing ruderal vegetation, is in an area of limited human use. South of the levee patrol road, the old Sacramento City Landfill is now capped, vacant land. An erosion control products manufacturer, Bell Marine Company, conducts business immediately upstream of the site, and has limited views of the proposed repair area. Recreation trails in Discovery Park, located on the other side of the American River, may provide limited views of the site.

4.2.1.7 Sac 53.5R

Sac 53.5R is covered with primarily ruderal vegetation. There was garbage strewn around the site on the day of the January 2008 site surveys. This site is not readily visible from the roadway that borders the site to the west. On the other side of the roadway, the agricultural use of the land suggests minimal exposure to the site. There is evidence that the site is used

for fishing, although the site has low aesthetic value due to denuded vegetation, erosion and trash. On the opposing side of the river, the residential use is set back from the riverbank to such an extent that views of the erosion site are effectively precluded.

4.2.1.8 Sac 177.8R

Sac 177.8R is comprised of primarily low growing ruderal cover. From Highway 45, which borders Sac 177.8R to the west, it is possible to view the entire site. West of Highway 45, the land is in agricultural production and affords no views of the erosion site. North of the site, and to the west across the river, the land is undeveloped riverine habitat associated with the Llano Seco Riparian Sanctuary and is not open to public access. The site is perhaps most easily viewed by boat traffic on the river.

4.2.1.9 Sac 16.8L

Sac 16.8L is located at the western edge of the town of Isleton, adjacent to Highway 160. The site, which is primarily riparian scrub, begins nearly at the guard rail of the highway and extends to the water at a 2:1 (horizontal to vertical) slope. Vegetation on the site is sufficient to mask much of the severe erosion. Due to its location, there is no recreational use of the site. Primary views are obtained from the waterside of the site. Grand Island Road, located on the other riverbank, also provides views of the erosion site.

4.2.1.10 Sac 42.7R

South River Road runs adjacent to Sac42.7R. From this roadway, the ruderal vegetation of the erosion site is somewhat visible. The site is also visible from River Road, which runs the levee crest on the opposing side of the river. The surrounding area is in agricultural use, and travel on these thoroughfares is moderate to light.

4.2.1.11 Sac 55.2 L

Sac 55.2L is dominated by riparian forest and ruderal vegetation, however is has been heavily altered by the residents of the homes on the landside of the standard patrol road on the levee crest. The area has gardens, picnic tables, and private docks and is accessible only to these homeowners.

There are many marinas in the area, and recreational boaters have a view of the erosion site from the water. The site can also be seen from South River Road, on the opposite side of the river.

4.2.1.12 Sac 77.2L

The primary vegetative cover on Sac 77.2L consists of valley oak dominated riparian forest and ruderal cover. Primary views of the site are from Garden Highway, which runs along the levee crest. It is also possible to view the site from Road 117, which runs though the agricultural land on the opposite side of the river, along the levee.

4.2.1.13 F 28.5R

F 28.5R is located in an area of heavy recreational use. Yuba City is located to the east. Stairs provide access from the city's downtown area to the patrol road on the levee crest,

which is used for activities including biking and running. On the opposite side of the river, in Marysville, a park provides water access.

Views of the erosion site are not available from street level in downtown Yuba City. Only those buildings near the levee with several stories are afforded views. The site can be seen from the 5th Street/Twin Cities Memorial Bridge (which runs roughly east to west at the downstream limit of the site), however these views are limited by obstruction caused by the railroad bridge, and the speeds traveled on this major roadway.

Although the site is primarily covered in ruderal vegetation, the trees associated with the fragmented riparian forest element of the site vegetation provide cover.

4.2.2 Regulatory Setting

4.2.2.1 Federal and State Laws and Regulations

Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act establishes a method for providing federal protection for certain free-flowing rivers to preserve them and their immediate environments for the use and enjoyment of present and future generations. Eligible rivers can be designated as Wild River Areas, Scenic River Areas, or Recreational Rivers. Section 10 includes management direction for these designated rivers. In regard to the designated river, Section 10(a) states that "primary emphasis shall be given to protecting its aesthetic, scenic, historic, archaeologic, and scientific features."

The lower American River has been designated as a Recreational River under the Wild and Scenic Rivers Act. The erosion sites located within the American River Parkway are subject to the conditions of this act. The National Parks Service, working under the United States Department of the Interior, has the jurisdiction for the determination of whether any violations occur. Preservation of the natural beauty of the American River and surrounding parkway under this act has established a considerable aesthetic resource available for enjoyment by residents and visitors to the Sacramento Region (Dangemond 2000).

California Scenic Highway Program

The California Scenic Highway Program, established in 1963 by the State Legislature, is managed by the California Department of Transportation (Caltrans). The program establishes the State's responsibility for the protection and enhancement of identified scenic roadways from changes that would degrade the aesthetic quality of lands adjacent to highways. Highway 160, which is located on the levee crest adjacent to Sac 16.8L, is designated as a scenic highway (Caltrans 2007).

4.2.2.2 Local Laws and Regulations

At the regional level, aesthetic resource policies provide for the maintenance and protection of significant visual and aesthetic resources that contribute to the identity and character of an area, through sensitive planning and design, maintenance, and code enforcement.

American River Parkway Plan

Aesthetics are an important component of the American River Parkway. A primary goal in the American River Parkway Plan is enhancing scenery and aesthetics. In order to

accomplish this goal, impacts (including aesthetics) must be minimized. Policies to prevent loss of aesthetic value include development and implementation of an anticipatory erosion control program based on identifying and treating eroding sites before they become a critical threat to the levee system and ideally before the riparian corridor is lost. When necessary to prevent such a loss, appropriate erosion control measures must be designed and constructed. Each project must consider the nature of the erosion threat and the most effective method for controlling erosion with the least damage to riparian vegetation, wildlife, and the aesthetics of the final product.

In addition, portions of the Parkway may be temporarily closed to certain uses in order to restore habitat values, visual quality, and recreation opportunities, upon assessment that the environmental resources, aesthetics, or recreational setting of the Parkway have become degraded. If artificial lighting is needed after dusk during the construction phase of the erosion control project, it shall be carefully planned to provide essential human safety and security while minimizing impacts to wildlife and night sky aesthetics through the use of techniques such as optimizing foot candle ratios, shielding, re-aiming, non-glare lighting, full cut off optics, short heights, timers, motion sensors, and adjacent native tree and shrubbery plantings.

City of Sacramento General Plan

Policy ER 7.1.1 of the City of Sacramento draft 2030 General Plan states that the city shall protect views from public places to the Sacramento and American Rivers (City of Sacramento).

City of Yuba City General Plan

Chapter 8 of the General Plan for the City of Yuba City sets forth the goal of preserving and enhancing visual and scenic resources (8.1-G-3).

Sacramento County General Plan

The Scenic Highways Element of the Sacramento General Plan was adopted on September 18, 1974 by the Sacramento County Board of Supervisors. The primary goal of the element is to "preserve and enhance the aesthetic quality of scenic roads without encouraging unnecessary driving by personal automobile."

The Element identifies the major visual problem associated with the preservation of River Road's scenic qualities as the removal of vegetation that historically took place in conjunction with revetment. Cited within this Element is Senate Concurrent Resolution No. 151 of July 10, 1969, with states that "the preservation of natural beauty, shade and wildlife habitat on the levees is important from a recreational and aesthetic viewpoint."

County roads that are protected under scenic corridor designations include the county roads that run on the crowns of the levees along the rivers and sloughs of the Delta, and Garden Highway, which also runs along the crown of the Sacramento River levee, from the Sacramento City limits north to the Placer County line.

In addition, the Sacramento and American Rivers are protected within Sacramento County by scenic corridors that extend 500 feet to each side of the river, as measured from the middle of the channel, or by a minimum corridor 300 feet from the edge of the river (Sacramento County 1993).

Solano County General Plan

Policies RS.P-34 through RS.P-36 of the Administrative Draft of the General Plan for Solano County protect the unique scenic features of the county, support and encourage practices that reduce light pollution, and protect the visual character of designated scenic roadways (Solano County 2008).

The Land Use and Circulation Element of the General Plan identifies lands along the Sacramento River and its delta tributaries as significant recreational sites, and sets forth policies to preserve the scenic quality of the Sacramento River and Delta area as a valuable element of the natural landscape and an important scenic resource through compatible land uses.

Yolo County General Plan

As set forth in Policy OS 9, Scenic Areas, Yolo County maintains scenic highways and waterways or riverbank corridor areas of scenic value as part of its open space preservation program. It is a stated goal of the general plan to encourage "landscaping to enhance the community and preservation of rural scenery" (GPG 25) (Yolo County 1983).

4.2.3 Environmental Effects

Effects are considered significant if the repair of the erosion sites would:

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

4.2.3.1 Alternative 1: Proposed Action

Construction equipment, possibly including a crane barge, excavator, and bulldozer, would be visible at the erosion sites during construction. Homeowners and employees of nearby businesses, where applicable, would be able to see this equipment, as would boaters and individuals using the levee bike paths. Motorists may also be subject to viewing this equipment from a variety of vantage points.

The presence of the construction equipment would degrade the visual quality of the erosion sites for the period of construction, approximately 120 days. Due to this limited duration, the effects of the construction equipment on the visual quality of the site are considered less than significant.

Visual effects from the placement of rock slope protection would be offset by the installation of IWM, soil fill and plantings. It is anticipated that these features would successfully establish and cover the riverbank within a 2 year period. No impact to visual resources associated with scenic highways is anticipated. Furthermore, the proposed repairs would not create a new source of light or glare. Therefore, the impacts to visual resources are considered less than significant.

4.2.3.2 Alternative 2: Thin Rock Armor

Construction impacts related to this alternative would be similar to Alternative 1. Following construction, however, the aesthetic impacts would be much different. A thin layer of rock revetment does not provide adequate area for onsite mitigation planting. The result would be a barren landscape subject to natural establishment for vegetative cover.

4.2.3.3 Alternative 3: No Action

Under this alternative, no action would be taken to halt erosion at the erosion sites. Aesthetic resources associated with the existing levees would remain unchanged for the immediate future. Wave wash, flood flows, and human disturbance would contribute to continued erosion and risk of levee failure, however, and it is reasonable to assume that the aesthetic nature of these areas following a levee breach would be characterized by significantly degraded visual character and quality.

4.2.4 Mitigation

The revetment process may result in temporary obstruction of riparian vegetation in the repair areas, and limited tree removal may be necessary. Ultimately, re-vegetation and site restoration procedures incorporated into the proposed levee repairs would add positive elements of visual resources to areas that have been degraded through erosion. In the long term, the project is expected to improve the visual quality of the erosion sites. No mitigation is required.

4.3 Recreation

4.3.1 Existing Conditions

There is a wide array of recreation activities that take place on the Sacramento River and its tributaries. Typical water-based activities include: fishing (from boat or bank), water skiing, sailing, boat cruising, operating personal watercraft, canoeing and kayaking, houseboating, hunting, swimming, boat camping, and windsurfing. On land, recreational activities typically consist of hunting, camping and picnicking, walking for pleasure, bicycling, viewing and photographing wildlife, and general sightseeing. A summary of the typical recreational uses of each of the erosion sites is provided below in Table 4-4.

Table 4-4 Recreation Uses

Erosion Site	Recreational Use
SB 16.6R	None
CS 21.8R	Infrequent use by hunters
Sac 49.7L	Heavy use for walking, biking, etc. Also in area of heavy boating. Near Garcia Bend Park (RM 49) and Stan's Yolo Marina (RM 50)
Sac 52.3L	Heavy use for walking, biking, etc. High recreational boat use area.
LAR 0.3L	Heavy use for swimming, fishing, biking, walking, etc. Located near

Erosion Site	Recreational Use
	Discovery Park
LAR 2.8L	Evidence of moderate, unapproved use by transients
Sac 53.5R	Moderate use by fishermen
Sac 177.8R	None
Sac 16.8L	Light landside use; located near Vieira's Resort (RM 15) and Isleton Boat Ramp and Storage (RM 18), which provides access for boating, kayaking, and fishing
Sac 42.7R	Light. Near Clarksburg Marina (RM 42), which provides access for boating, kayaking, and fishing
Sac 55.2 L	Heavy use presumed by private individuals who have enclosed a portion of the site with fencing. Docks also located onsite. The site is located near Sherwood Harbor Marina (RM 55) and Sacramento Yacht Club (RM 55.5)
Sac 77.2L	The site does not appear to support any recreational use, however it is possible that it is used for passive recreation by the occupants of nearby residences
F 28.5R	Heavy use for swimming, fishing, biking, walking, etc.

4.3.2 Regulatory Setting

4.3.2.1 Federal and State Laws and Regulations

Wild and Scenic Rivers Act

The lower American River has been designated as a Recreational River under the Wild and Scenic Rivers Act (See Section 4.2.2.1). The erosion sites located within the American River Parkway are subject to this act, which protects recreational use.

4.3.2.2 Local Laws and Regulations

American River Parkway Plan

The American River Parkway Plan strives to preserve, protect, and improve the recreational resources of the parkway. The parkway is oriented to passive, unstructured water-enhanced recreation activities. The plan encourages the proactive management of erosion sites to protect recreational resources. Policy 3.14 states: "Portions of the Parkway may be temporarily closed to certain uses in order to restore habitat values, visual quality, and recreation opportunities, upon assessment that the environmental resources, aesthetics, or recreational setting of the Parkway have become degraded" (County of Sacramento 2006).

City of West Sacramento General Plan

Goal D, set forth in the Recreational and Cultural Resources Section of the West Sacramento

General Plan, identifies the city's desire to "provide and encourage" public access to the Sacramento River for recreational purposes (City of West Sacramento 2004).

Solano County General Plan

Lands along the Sacramento River are identified in the current Land Use and Circulation Element of the Solano County General Plan, adopted December 1980 and as amended through June 2001, as significant outdoor recreational sites. These areas are affected by the county policy to provide public and private recreation and access to the river and delta areas for such uses as fishing, boating, picnicking, hiking, and nature study in a manner that is compatible with surrounding land uses.

Sutter County General Plan

Goal 5.A of the Recreation and Cultural Resources element of the Sutter County General Plan Policy Document is to provide adequate park and open space areas for passive and active recreational, social, educational, and cultural opportunities (Sutter County 2006).

Yolo County General Plan

A fundamental goal of the Yolo County General Plan (GPG 4) is to provide recreational opportunities.

4.3.3 Environmental Effects

Based on the significance criteria set forth in the CEQA guidelines, effects on recreation would be considered significant if implementation would:

- Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated;
- Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment;
- Result in a substantial loss of recreational opportunities; or
- Substantially increase the risk of injury to the public on, or adjacent to, the proposed repair sites.

4.3.3.1 Alternative 1: Proposed Action

The project site repairs would be designed to enhance the natural qualities of the area. Fishing, swimming, walking, biking, and boating opportunities would remain consistent with conditions prior to construction. Existing tree canopy would be preserved, to the greatest extent possible, to provide quality habitat for wildlife, as well as shade and visual character for persons interested in recreation on or near the sites.

Modification of the slope at the erosion sites would reduce the risk of falling to site users. The steep, eroded banks at the sites would be replaced with gradual, plant-able slopes. A gradation of rock revetment would be used to eliminate voids in the repair rock that could potentially lead to foot entrapment.

Limits levied on access to areas of construction activity for public safety purposes would be temporary. None of the erosion sites support sufficient recreational use to conclude that

these closures would cause overcrowding of recreation sites nearby the areas proposed for repairs. Although no long term impacts to recreational resources are anticipated, short term effects associated with the construction process may have potentially significant effects.

4.3.3.2 Alternative 2: Thin Rock Armor

This alternative proposes to place a thin layer of rock revetment over the existing, eroded levee face to a height sufficient to preclude further erosion. During construction activities, site access would be eliminated and detours to local trails may be required. It is unlikely that these temporary activities would negatively affect the recreational carrying capacity of the surrounding areas.

Covering the erosion sites in rock revetment would temporarily fix the erosion problems, but would not address issues associated with slope stability. Access to recreational users would possibly be limited by their ability to safely access the sites. Furthermore, the barren landscape that would result from revetment activities may not be as aesthetically pleasing to potential recreationalists. As a result, it is possible that fewer people would utilize the sites.

4.3.3.3 Alternative 3: No Action

Under this alternative, no action to halt erosion would be taken at the erosion sites. Recreation would continue as described in Section 4.3.1.

4.3.4 Mitigation

Implementation of the following mitigation measures would reduce potential impacts associated with the preferred alternative to a less-than-significant level.

- Signage and/or buoys would be provided at each of the sites to warn of the potential hazards during construction.
- Where construction zones encompass recognized recreation trails, alternate routes and detours would be imposed during construction.
- The design of the restored levees would ensure local approach visibility for recreational boaters through the use of natural indicators, such as partially emergent portions of IWM and vegetation on the low elevation areas, to act as visual warning of the presence of shallowly submerged hardscape. This would reduce the hazard associated with placement of revetment by providing adequate visual warning to permit avoidance of possible injury or damage to property. Furthermore, the IWM would be oriented in a downstream direction to reduce its straining effects on the river and the danger of entrapment.

4.4 Cultural Resources

Archaeological sites, historic buildings and structures, landscapes, and objects are the fabric of our national heritage. Collectively known as cultural resources (or sometimes heritage assets), they are our tangible links with the past. This section describes the cultural (historical, archaeological, and paleontological) resources present, or potentially present, on the erosion sites.

To determine if prehistoric or historic cultural resources were previously recorded within the

project area, a cultural resources literature search was preformed by SWCA Environmental Consultants (SWCA) in January and February 2008 at the appropriate Cultural Resource Information System (CHRIS) centers for an area that included a ½-mile radius around the construction easement of each of the 13 sites. In addition, these sites were investigated by SWCA archeologists through intensive-level pedestrian surveys during January and February 2008.

4.4.1 Environmental Setting

4.4.1.1 Historic Setting

Occupation of the Sacramento Valley and Sacramento-San Joaquin Delta is believed to have occurred as early as 12,000 years ago. However, it is possible that alluvial deposits have buried many prehistoric sites in this area. Experts have estimated that as much as 33 feet of sediment has accumulated along the lower stretch of the Sacramento River drainage system during the last 5,000 to 6,000 years (Moratto 1984, as cited in Martinez et al 2008).

The project lies within a region historically occupied by three Native American groups (Kroeber 1925; Levy 1978; Johnson 1978; Wilson and Towne 1978 as cited in Martinez et al 2008). The groups include the Patwin, who occupied the area of the northernmost erosion sites west of the Feather River; the Nisenan (also known as the southern Maidu), who occupied the area east of the Feather River between Sacramento and Marysville; and the Plains Miwok, a subgroup of the Eastern Miwok, who occupied the area south of Sacramento.

Patwin villages were generally established along the Sacramento River and in the river valleys. The Valley Nisenan generally established semi-permanent settlements or winter villages on low, natural rises along streams and rivers, including the American, Feather, and Sacramento Rivers. Permanent settlements of the Plains Miwok were located on high ridges or knolls near watercourses, including the Sacramento River, or on the sandy islands in the Delta.

A wide variety of tools, implements, and enclosures were used to hunt, collect, and process natural resources, including bows and arrows, spears, traps, slings, blinds, bone harpoons, hooks, nets, and weirs. Woven tools—seed beaters, burden baskets, rope, and carrying nets—and sharpened digging sticks were used to collect plant resources. For processing food, a variety of tools were used, including bedrock mortars, portable mortars (predominantly basket hopper mortars) and pestles, stone knives, mussel shell knives, stone scrapers, and a variety of bone tools. The Patwin also used pole-propelled rafts to traverse rivers and bays.

Largely as a result of the Gold Rush, California became the 31st state in 1850. By 1853, the population of the state exceeded 300,000 and in 1854 Sacramento became the state capital. Sacramento, Solano, Sutter, Yolo, and Yuba Counties were each one of the original 27 counties created when California achieved statehood. Glenn County was not formed until 1891 after it was separated from Colusa County (Gudde 1969; Hoover et al. 2002 as cited in Martinez et al 2008).

The Gold Rush promoted the growth of settlement and economic development of the region, with the river systems, particularly the Sacramento River, a main route for supplies. Today's

City of Sacramento, for example, served as a river transportation hub and had 12 stage lines by 1853. Sacramento was also the westernmost point of the Pony Express and the terminal of the first California railroad (Beck and Haase 1974 as cited in Martinez et al 2008).

Early levee construction focused on the American and Sacramento Rivers near the Sacramento business district and the Sacramento-San Joaquin Delta. Following flooding in the City of Sacramento, an earthen berm ranging in height from 3 to 5 feet was constructed along the Sacramento River from near today's William Land Park in Sacramento to the river's confluence with the American River in 1850 (Marschner 2001, as cited in Martinez et al 2008). In the roughly 15 years that followed, several subsequent flooding events resulted in periods of levee construction. Between 1864 and 1868, the last 2 miles of the American River was channelized. The federal Sacramento River Flood Control Project was implemented in 1917. At this time, existing levees were upgraded to meet new standards on width (20 feet at the crown) and slopes.

4.4.1.2 Current Setting

The erosion sites are currently surrounded primarily by agricultural uses, although specific designations vary (see Section 4.1). The 13 erosion sites were analyzed in terms of their potential to impact known cultural resources, as well as undocumented and potentially significant cultural resources, including buried human remains, within the project area. Cultural resources include archaeological sites, features and isolated finds, built resources over 50 years of age, and paleontological resources. A records review revealed the following documented resources on or adjacent to the erosion sites:

- CA-SAC-482H (P-34-509). This historic-era archeological site within LAR 3.0L consists of an 11.3-mile segment of federal levee along the south bank of the American River. At present, it exhibits erosional disturbance. Although the levee is part of the pre-1944 Sacramento River Flood Control Plan, and an integral component of the history of the Sacramento Valley, the site does not qualify as a historical resource and is recommended not eligible for listing on the National Register of Historic Places (NRHP) and the California Register of Historic Resources (CRHR) because it does not retain sufficient integrity of setting or physical integrity to convey its period significance.
- P-11-577. A historic-era resource located immediately adjacent to Sac 177.8R. Consists of a pumphouse constructed in 1918.
- P-57-425. A historic-era resource within Sac 53.5R. Consists of the remains of fourteen wood pilings aligned north-south and parallel to the western shore of the Sacramento River, which may be the remains of a mid-to-late eighteenth century wharf associated with Lufkin Landing. The pilings were not observed during the 2008 SWCA surveys, presumably due to high water levels. The pilings have been fully documented and include no further potential to contribute to cultural heritage issues. By definition, the isolate is not significant and not eligible for inclusion on the CRHR.

No prehistoric archaeological sites, or sites of traditional Native American religious or cultural significance, including sacred sites or contemporary use areas, have been identified in the project area. In addition, a fossil and geology review completed for each of the

thirteen erosion sites determined that none of the fossil localities documented within Glenn, Sacramento, Solano, Sutter, and Yolo counties occur within the project area (University of California Museum of Paleontology 2008 as cited in Martinez et al 2008). The erosion sites generally occur in soil formations that are not fossiliferous.

4.4.2 Regulatory Setting

4.4.2.1 Federal and State Laws and Regulations

American Indian Religious Freedom Act

The American Indian Religious Freedom Act (AIRFA) is a 1978 United States federal law and a joint resolution of Congress which pledged to protect and preserve the traditional religious rights of American Indians, Eskimos, Aleuts, and Native Hawaiians. Before the AIRFA was passed, certain U.S. federal laws interfered with the traditional religious practices of many American Indians.

Archeological Data Preservation Act

An Act to provide for the preservation of historic American sites, buildings, objects, and antiquities of national significance, and for other purposes by specifically providing for the preservation of historical and archeological data (including relics and specimens) which may be destroyed by any alteration of the terrain caused as a result of any federal construction project or federally licensed activity or program.

Archeological Resources Protection Act

The purpose of this act is to secure, for the present and future benefit of the American people, the protection of archaeological resources and sites which are on public lands and Indian lands, and to foster increased cooperation and exchange of information between governmental authorities, the professional archaeological community, and private individuals having collections of archaeological resources and data which were obtained before October 31, 1979. Under this act, no person may excavate, remove, damage, or otherwise alter or deface or attempt to excavate, remove, damage, or otherwise alter or deface any archaeological resource located on public lands or Indian lands unless such activity is pursuant to an exemption contained in, or a permit issued under or referred to in, Section 4 of the Act.

Code of Federal Regulations

The Code of Federal Regulations sets the criteria for listing a site in the NRHP. These criteria are based upon the significance to American history, architecture, archaeology, engineering, and culture.

National Historic Preservation Act

Properties of traditional religious and cultural importance to Native Americans are considered under Section 101 of the National Historic Preservation Act (NHPA). Section 1006 requires federal agencies to take into account the effects of their undertakings on any district, site, building, structure, or object that is included in, or eligible for inclusion in, the NRHP and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. Under this section, the significance of any adversely affected cultural resource is assessed and mitigation measures are proposed to reduce any

impacts to an acceptable level.

Public Resources Code

Section 5024.1 requires evaluation of historical resources to determine their eligibility for listing on the CRHR. The purpose of the register is to maintain listings of the state's historical resources and to indicate which properties are to be protected from substantial adverse change.

State of California Health and Safety Code

Section 7050.5 of the Health and Safety Code covers the discovery of human remains, except on federal lands. The code states that, following discovery, no further disturbance shall occur until the County Coroner has made a determination of origin and pursuant to Public Resources Code Section 5097.98.

4.4.2.2 Local Laws and Regulations

City of Sacramento General Plan

The City of Sacramento intends to preserve and celebrate Sacramento's heritage and recognize the importance of that heritage to the City's unique character, identity, economy, and quality of life. To that end, the city promotes the recognition, preservation, and enhancement of historic and cultural resources throughout the city.

City of West Sacramento General Plan

The City of West Sacramento's General Plan is designed to preserve and enhance West Sacramento's historical heritage and protect its Native American heritage. To accomplish this goal, the following policies are implemented: the City refers development proposals that may adversely affect archaeological sites to the California Archaeological Inventory, Northwest Information Center, at Sonoma State University; and before approving projects that may affect an archeological site an attempt is made to mitigate adverse impacts according to the recommendations of a qualified archeologist, generally including a development permit that requires on-site monitoring by qualified personnel of excavation work in areas identified as archaeologically sensitive.

City of Yuba City General Plan

Policies related to the preservation of the city's cultural resources include: identifying and preserving the archaeological, paleontological, and historic resources that are found within the planning area; encouraging the preservation of historic sites, buildings, and structures; and promoting the registration of historic sites, buildings, and structures in the National Register of Historic Places, and inclusion in the California Inventory of Historic Resources. In accordance with CEQA and the State Public Resources Code, the city requires the preparation of a resource mitigation plan and monitoring program by a qualified archaeologist in the event that archaeological resources are discovered.

Glenn County General Plan

Glenn County General Plan states that impacts to individual important cultural resources are significant. Therefore plan goals, policies, implementation measures, and standards for cultural resources have been adopted that will reduce the impact. Plan policies and implementation measures for cultural resources include: protection of identified areas of

unique historical or cultural value within the county and preservation of those sites for educational, scientific and aesthetic purposes; requiring proper evaluation and protection of archaeological resources discovered in the course of construction and development, and discouraging urban growth in floodplains, aquifer recharge areas, scenic and historic sites, or other sensitive areas as specified in the general plan.

Sacramento County General Plan

Sacramento County's goal is to promote the inventory, protection and interpretation of the cultural heritage of Sacramento County, including historical and archaeological settings, sites, buildings, features, artifacts and/or areas of ethnic historical, religious or socio-economical importance. Sacramento County has implemented the following policies to meet that goal: attention and care must be taken during project review and construction to ensure that cultural resource sites, either previously known or discovered on the project site, are properly protected with sensitivity to Native American values; structures with architectural or historical importance must be preserved to maintain exterior design elements; and known archaeological and historic sites must be protected from vandalism, unauthorized excavation, or accidental destruction.

Solano County General Plan

Several tasks to meet the goal of effectively protecting cultural resources are identified in the general plan, including the development of a program to systematically avoid conflicts with Native American cultural places by ensuring that local and tribal governments are provided with information early in planning processes, as well as a program to enable tribes to manage their cultural places.

Sutter County General Plan

Sutter County's General Plan strives to identify, protect, and enhance Sutter County's important historical, archeological and cultural sites. The county promotes the registration of historic sites, buildings, structures and objects in the NRHP, and inclusion in the California State Office of Historic Preservation's California Points of Interest and California Inventory of Historic Resources. Additionally, the county solicits the views of the local Native American community in the cases where development may result in disturbance to sites containing evidence of Native American activity and/or tomb sites of cultural importance.

Yolo County General Plan

Yolo County's General Plan preserves cultural and aesthetic resource values. The county requires evaluation and protection of archeological resources discovered in the course of construction and development. This is implemented by coordinating planning decisions involving agricultural/open space land with public agencies involved in conservation, preservation and protection of natural resources.

4.4.3 Environmental Effects

Each of the erosion sites were previously disturbed by waterway and/or roadway development, including channelization and earthen levee construction. While the possibility always exists that potentially significant cultural resources could be encountered during construction and project implementation, this is an unlikely result of the proposed project due to the fact that it is restoring levees to roughly their original configuration. None of the

alternatives analyzed for the purposes of this report include any grubbing or excavating activities, therefore, the potential to uncover previously undiscovered historic or archeological resources through project implementation is minimal.

Impacts to cultural resource would be considered significant if the project would:

- Cause a substantial adverse change in the significance of a historical or archaeological resource pursuant to CEQA (§15064.5);
- Directly or indirectly destroy a unique paleontological resource or site;
- Disturb any human remains, including those interred outside of formal cemeteries; or
- Adversely affect undocumented cultural resources, including human remains.

4.4.3.1 Alternative 1: Proposed Action

Under the proposed alternative, no grading would occur. Rock revetment would be placed on the existing slope to construct a bench for stability, and cover the upper slope as necessary to prevent further erosion. The completed repair would be planted with native vegetation to restore the existing scenic and habitat qualities of the sites.

The only archaeological site recorded within the proposed project area, a segment of the American River levee (CA-SAC-482H) has been recommended ineligible for inclusion on the CRHR. The set of wood pilings (P-57-425) within the Sacramento River is an isolated find that is not significant and not eligible for inclusion on the CRHR.

Although not formally recorded within the project area, the Sacramento River levee is considered a cultural resource. However, because the levee does not retain sufficient integrity of setting or physical integrity to convey its period of significance, it does not qualify as a historical resource and is recommended not eligible for listing on the CRHR. The resources would be avoided to the greatest extent possible; however, disturbance would not constitute a significant impact.

A fossil and geology review determined that no recorded fossil localities are within the erosion sites and the erosion sites generally occur in soil formations that are not fossiliferous. The proposed project will thus have no impact on paleontological resources.

Considering the history of channelization of the rivers and construction of the levee system, as well as roadway development on top of the levee, the project area is considered to have a low sensitivity for discovery of prehistoric, ethnohistoric, or historic-era cultural material or subsurface features. It is possible, however, that undocumented cultural resources, including human remains, may be affected during construction or ground-disturbing activities. Historic materials might include metal, glass, or ceramic artifacts; examples of significant discoveries might include former privies or refuse pits. Prehistoric or ethnohistoric materials might include chipped stone, stone milling tools, and soil darkened by cultural activities (midden); examples of significant discoveries would include villages or burials. Due to the possible presence of undocumented cultural resources within the project area, construction-related impacts on cultural resources would be potentially significant.

4.4.3.2 Alternative 2: Thin Rock Armor

Alternative 2 would simplify the construction proposed in Alternative 1 by placing a thin,

relatively uniform layer of rock revetment on the entire slope. This alternative would repair the erosion at the sites, but would not address stability issues, and may preclude onsite re-vegetation planting at some of the sites. As in Alternative 1, there would be no grading of the site, and the potential to impact cultural resources would be the same as discussed above. Due to the possible presence of undocumented cultural resources within the project area, construction-related impacts on cultural resources would be potentially significant

4.4.3.3 Alternative 3: No Action

Under this alternative no work would be conducted at the erosion sites, therefore eliminating the possibility of discovering undocumented cultural resources. This alternative would not have a significant effect on cultural resources on the erosion sites.

4.4.4 Mitigation

The levee system has been assumed to be eligible for listing on the NRHP, according to an agreement with the California State's Historic Preservation Officer (SHPO) on March 23, 2006. That agreement was implemented for the repair of critical erosion sites in 2006 and permitted a determination of no adverse effect to historical resources since any adverse effects would be mitigated to such a level by "restoration of the original configuration of the levees" (USACE 2006). For the purposes of this project the SHPO may make a similar agreement.

Should cultural resources be encountered during construction activities, work within 100 feet of the area shall be halted and a qualified archeologist, who meets the Secretary of the Interior's standards, shall be notified immediately to evaluate the resources encountered. The archaeologist will examine the findings, assess their significance, and recommend appropriate procedures to either further investigate or mitigate adverse impacts (e.g., adverse effect on a significant historical resource) on the resources encountered in conformance with the protocols set forth in Public Resources Code Section 5097.98. Treatment measures typically include avoidance, capping with sterile fill, or mitigation of impacts through a data recovery program (e.g., excavation or detailed documentation).

The County Coroner shall be immediately notified of the finding of any human remains. If the human remains are determined to be prehistoric, the Coroner will notify the Native American Heritage Commission (NAHC), which will determine and notify the most likely descendent. The most likely descendent shall complete a site inspection within 24 hours of notification and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials. If prehistoric or ethnohistoric resources or human remains are discovered during construction, a qualified Native American monitor shall be retained in consultation with the recommendations provided by the NAHC and/or most likely descendent to monitor any ground-disturbing activities in native soils or sediments.

Implementation of mitigation measures would ensure that any undocumented cultural resources or inadvertent discoveries of cultural resources would be properly recorded and the historical significance of the resources documented, therefore this impact is less-than-significant.

4.5 Vegetation and Wildlife Resources

Vegetation, habitat, and wildlife mapping surveys were conducted in January and February 2008 utilizing both aerial photos and ground truthing techniques to assess existing vegetative cover types and habitat values to determine which biological resources may be directly or indirectly impacted by proposed construction and maintenance activities. The boundaries of each identified habitat type were defined and mapped in the field. This data was then refined by digitizing the information using geographic information systems (GIS) to create a database of habitat type, area, and spatial proximity (Appendix C).

Tree surveys were performed in January and February 2008. Trees with a DBH of 4-inches or greater were included in these surveys. The exact location of each qualifying tree was recorded in the field using professional grade global positioning system (GPS) equipment. Additional information regarding DBH, general health, canopy width, and height were also recorded. Qualifying trees were assigned an individual identification number and marked with an aluminum tree tag. Tree survey results are presented in Appendix D. A table of all plant species observed within the erosion sites is presented in Appendix E; all wildlife species observed are documented in Appendix F.

4.5.1 Environmental Setting

The erosion sites contain 5 different land cover types. These include riparian forests, riparian scrub, ruderal, emergent marsh, and open water (Table 4-5). Classification of these community types is based on Holland (1986), Sawyer and Keeler-Wolf (1995), and Barbour, et al (2007). Other terrestrial cover types include unvegetated cover, such as access roads (primarily along the levee crown). Each of these land cover types is described briefly below.

Riparian Forest

Riparian habitats are generally associated with rivers, low gradient streams, floodplains and occasionally ponds and canals. The composition of species in riparian forest communities is highly variable and dependent on geographic location, elevation, substrate, and amount of flow in the watercourse.

This community type is dominated by tall, winter-deciduous broad-leaved trees with a canopy cover ranging from open to closed (Holland 1986, Barbour et al. 2007). At some erosion sites, stands of riparian forest have been fragmented by anthropogenic (i.e., human-caused) disturbances associated with levee construction and maintenance. Primary dominant tree species observed within the various repair sites included valley oak *(Quercus lobata)* and Fremont's cottonwood *(Populus fremontii)*. Associate or subdominant tree species observed included California black walnut *(Juglans californica),* California box-elder *(Acer negundo* var. *californicum),* Oregon ash *(Fraxinus latifolia),* western sycamore *(Platanus racemosa),* Goodding's (black) willow *(Salix gooddingii),* and white alder *(Alnus rhombifolia).*

Shrub layers present within this community type were sparse to well-structured and included blue elderberry *(Sambucus mexicana),* California blackberry *(Rubus ursinus),* Himalayan blackberry *(Rubus discolor),* California wild rose *(Rosa californica),* and poison oak *(Toxicodendron diversilobum).* Additionally, a liana (i.e., woody climber) component comprised of California wild grape *(Vitis californica)* was often present.

Depending on the degree of past disturbances within the various repair sites (e.g., mowing,

herbicide treatments, vandalism), the herbaceous ground layer is typically a mix of native and introduced (i.e., non-native) species, with non-native species often more dominant in terms of their overall frequency, density, and distribution within the ground layer. Commonly observed native plant species included California mugwort *(Artemisia douglasiana)*, horsetail *(Equisetum* sp.*)*, horseweed (*Conyza canadensis*), common bedstraw (*Galium aparine*), blue wild-rye *(Elymus glaucus)*, and Santa Barbara sedge *(Carex barbarae).* Commonly observed non-native species included white sweet-clover *(Melilotus alba)*, filaree *(Erodium* spp.), rip-gut brome *(Bromus diandrus)*, and Bermuda grass *(Cynodon dactylon)* (see Appendix E).

Wildlife species use riparian forest habitat for foraging, drinking water, thermal and escape cover, nesting and breeding, migration, and as dispersal corridors (including shade and cover habitat for fish and other aquatic species). In California, over 225 species of birds, mammals, reptiles, and amphibians depend on riparian habitats for their survival. Riparian habitats also provide important feeding, resting, and nesting habitat for neotropical migrant songbirds such as warblers, vireos, grosbeaks, and flycatchers. The most diverse bird communities in the arid and semi-arid regions of the western United States occur within riparian ecosystems (Barbour et al. 2007).

Commonly observed wildlife species (including aural vocalizations or their sign, including scat and tracks) at the erosion sites included western scrub jay *(Aphelocoma californica californica)*, American crow *(Corvus brachyrhynchos)*, northern flicker (*Colaptes auratus*), great blue heron *(Ardea herodias)*, belted kingfisher *(Ceryle alcyon)*, beaver *(Castor canadensis)*, and raccoon *(Procyon lotor).* Stick nests were observed within or adjacent to a number of erosion sites.

There are approximately 3.8 cumulative acres of riparian forest habitat within the erosion repair sites. This habitat type accounts for approximately 0% to 76% of the existing levee habitat on the various erosion sites.

Riparian Scrub

This habitat type typically occurs along the toe of levee slopes and supports willows (*Salix* spp.) and other low-growing woody species (typically less than 33 feet in height). These species are tolerant of frequent flooding and sustained inundation (Holland 1986, Barbour et al. 2007). In scour-prone areas, there is often little ground cover associated with this habitat type. In deltaic habitats where brackish waters occur, salinity may inhibit the growth of some woody associates such as white alder. Dominant shrub species observed included Goodding's willow, California wild rose, California blackberry, Himalayan blackberry, blue elderberry, arroyo willow *(Salix lasiolepis)*, and buttonbush *(Cephalanthus occidentalis).*

As with riparian forest, the values and functions of this habitat type for wildlife species are high. Typical wildlife species observed included ruby-crowned kinglet (*Regulus calendula*), yellow-rumped warbler (*Dendroica coronata*), and song sparrow (*Melospiza melodia*).

There are approximately 0.8 cumulative acres of riparian scrub habitat within the erosion repair sites. This habitat type accounts for approximately 0% to 36% of the existing levee habitat on the various erosion sites.

Ruderal

Ruderal (i.e., weedy) habitats are typically dominated by short-lived annual and biennial

introduced, non-native herbaceous grasses and broad-leaved forbs (i.e., wildflowers) that tend to persist within an area due to periodic disturbance (e.g., plowing, mowing, spraying). Among the various erosion sites, this community type typically occurs along the mid- to upper-slope and levee crown portions. Dominant non-native grasses observed included rip-gut brome, Bermuda grass, wild oat *(Avena fatua)*, smilo grass *(Piptatherum miliaceum)*, and Johnson grass *(Sorghum halapense)*. Dominant non-native forbs included filaree, yellow star-thistle *(Centaurea solstitialis)*, sweet fennel *(Foeniculum vulgare)*, burr-chervil *(Anthriscus caucalis)*, milk thistle *(Silybum marianum)*, and cut-leaf geranium *(Geranium dissectum)*. While native herbaceous species were infrequent throughout this habitat type in terms of their overall density and distribution, native species observed included common bedstraw, horsetail, telegraph weed *(Heterotheca grandiflora)*, and annual fireweed *(Epilobium brachycarpum)*.

Some of the more commonly observed plants recognized as "pest plants" by the California Invasive Pest Plant Council (Cal-IPC) included Himalayan blackberry, rip-gut brome, smilo grass, yellow star-thistle, giant reed *(Arundo donax)*, and perennial pepperweed *(Lepidium latifolium)*.

Despite a lack of native plant species richness and complexity, ruderal habitats provide local wildlife populations with food resources (e.g., seeds from annual grasses and forbs), as well as ample foraging, cover, and nesting opportunities for a variety of reptile, bird, and mammal species that may utilize the adjacent riparian forest and riparian scrub habitats.

There are approximately 6.9 cumulative acres of ruderal habitat within the erosion repair sites. This habitat type accounts for approximately 15% to 76% of the existing levee habitat on the various erosion sites.

Emergent Vegetation

Emergent vegetation is restricted to a relatively narrow saturation zone along the toe of the levee slope within a few of the erosion sites (SB 16.6R, CS 21.8R, and Sac 16.8) and is characterized by the presence of hydrophytic (i.e., "water-loving") herbaceous plant species that are able to tolerate fluctuating water levels and persist in continuously saturated soils. Commonly observed graminoids (i.e., grasses and grass-like plants including sedges and rushes) include Santa Barbara sedge, common rush *(Juncus effusus*), and Vaseygrass *(Paspalum urvillei)*. Commonly observed forbs include purple-top vervain *(Verbena bonariensis)*, western goldenrod *(Euthamia occidentalis)*, wild licorice *(Glycyrrhiza lepidota)*, bitter dogbane *(Apocynum androsaemifolium)*, and Suisun Marsh aster *(Symphyotrichum lentum)*.

Vegetation cover of this community type is generally sparse due to bankline erosion caused by water craft and high flow events. There are approximately 0.1 cumulative acres of emergent vegetation within the erosion repair sites. Due to the small percentage that emergent vegetation represents in terms of a total cover type among the various repair sites (0% to 7%), the overall habitat functions and value of this community type for wildlife resources is low. Nonetheless, it contributes to the overall complexity of the existing riparian forest and riparian scrub habitats (see the preceding discussions, above).

Revetment and Bare Substrate

Revetment dominated habitat types are those covered in a layer of quarry stone or river rock,

with few to no vegetative species present. Areas of the erosion sites that are not covered in revetment, but are nonetheless barren, such as access roads, are considered bare substrate.

Open Water

Each of the erosion sites is immediately adjacent to the open water of its associated river or slough, with the toe of the eroding levee extending under the mean water level. These areas, where the eroding portion of the levee is submerged, are classified as open water habitat, and form an average of 78% of the total erosion site.

Non-special-status fish species that occur in Central Valley streams and rivers, including the erosion sites, include river lamprey (*Lampetra ayresi*), striped bass (*Morone saxatilis*), American shad (*Alosa sapidissima*), largemouth bass (*Micropterus salmoides*), and several species of minnows (family Cyprinidae), sunfish (family Centrarchidae), and catfish (family Ictaluridae). The fish species assemblage in the Sacramento River also includes many other native and non-native species. In general, native species, such as Sacramento pikeminnow (*Ptychocheilus grandis*), hardhead (*Mylopharodon conocephalus*), Sacramento sucker (*Catostomus occidentalis*), and California roach (*Lavinia symmetricus*), spawn early in the spring. Many native fish species are adapted to rear in flooded areas that provide abundant cover and prey (Moyle 2002). With some exceptions, non-native species, such as green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), white catfish (*Ameiurus catus*) and channel catfish (*Ictalurus punctatus*), and largemouth bass spawn in late spring and in the summer. Many of the non-native fish species are more tolerant of warm water, low dissolved oxygen, and disturbed environments than native species. In general, they are adapted to warm, slow-moving and nutrient-rich waters (Moyle 2002).

Table 4-4 Percent Vegetation Cover at each Erosion Site

Erosion Site	Vegetation Cover					
	Riparian Forest	**Riparian Scrub**	**Ruderal**	**Emergent**	**Revetment**	**Bare Substrate**
SB 16.6R	-	28%	57%	7%	8%	-
CS 12.8R	-	36.5%	59%	2%	2.5%	-
Sac 49.7L	32%	-	60%	-	8%	-
Sac 52.3L	61%	-	37%	-	2%	-
LAR 0.3L	44%	-	56%	-	-	-
LAR 2.8L	36%	-	64%	-	-	-

Erosion Site	Vegetation Cover					
	Riparian Forest	**Riparian Scrub**	**Ruderal**	**Emergent**	**Revetment**	**Bare Substrate**
Sac 53.5R	21%	-	40%	-	24%	15%
Sac 177.8R	-	12%	70.5%	0.5%	-	17%
Sac 16.8L	76%	2%	15%	3%	4%	-
Sac 42.7R	23%	-	45%	-	18%	14%
Sac 55.2L	68%	-	31.5%	-	0.5%	-
Sac 77.2l	51%	5%	34%	-	-	10%
F 28.5R	22%	-	76%	-	-	2%
Average	33%	6.5%	50%	1%	5%	4.5%

Additional Site Features

IWM is an important feature of aquatic habitats, providing essential SRA and basking opportunities for aquatic wildlife. IWM is defined as any piece of dead wood, 6 inches DBH or larger, that extends into the water at the MSWL. IWM was observed at all of the erosion sites, with the exception of Sac 177.8R, during winter and spring 2008 field surveys. On those sites with recorded occurrences of IWM, coverage varied from 1 piece at LAR 0.3L to 27 pieces of IWM at CS 21.8R.

SRA, which is designated by the USFWS as Resource Category 1, is an important attribute of the aquatic area on the erosion sites. Shade is represented by overhead canopy cover and is measured by estimating the percent of shoreline in which riparian vegetation extends over the water during average seasonal flows. Overhanging shade is considered to benefit habitat quality by providing hiding cover and food availability for the focus fish species. The existing overhead shade cover at each site was determined by GIS analysis using a digitized canopy shapefile layer superimposed upon the seasonal shoreline positions. The shade cover proportions for the 13 sites range from zero up to 100%. Generally, greater shade cover occurs during summer when full tree canopies are present. See Appendix I for modeling of existing shade cover at each of the erosion sites.

4.5.2 Regulatory Setting

4.5.2.1 Federal and State Laws and Regulations

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) is enforced by the USFWS (16 USC Section 703-711). The original 1918 statute implemented the 1916 Convention between the United States and Great Britain (for Canada) for the protection of migratory birds. Later amendments implemented treaties between the United States and Mexico, Japan, and the Soviet Union (now Russia).

Specifically, the act includes the establishment of a federal prohibition to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird... or any part, nest, or egg of any such bird" unless such acts are permitted by regulations (16 U.S.C. 703). The federal definition of take includes activities that involve harassment, harm, pursuit, hunting, shooting, wounding, killing, trapping, capturing, or collecting, or to attempt to engage in any such conduct. Birds covered by this act include waterfowl, shorebirds, raptors, songbirds and many other species.

Fish and Game Code

Birds of prey are protected in California under the California Fish and Game Code section 3503.5, which states that it is unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird, except as otherwise provided by this code or any regulation adopted pursuant thereto. Construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered taking by CDFG. Any loss of fertile eggs, nesting raptors, or any activities resulting in nest abandonment would constitute a significant impact.

CDFG Streambed Alteration Agreement

Under sections 1600-1616 of the California Fish and Game Code, the CDFG regulates activities that would substantially divert, obstruct, or change the natural flow of a river, stream, or lake; substantially change the bed, channel, or bank of a river, stream, or lake; or use material from a streambed falls under CDFG jurisdiction. In practice, CDFG marks its jurisdictional limit at the top of the stream or lake bank, or the outer edge of the riparian vegetation, where present, and sometimes extends its jurisdiction to the edge of the 100-year floodplain. Notification is required prior to any such activities and CDFG will issue an Agreement with any necessary mitigation to ensure protection of the state's fish and wildlife resources. However, since the proposed action is a federal project, obtaining a Streambed Alteration Permit is not necessary.

Habitat Conservation Plan

Section 10 of the federal ESA authorizes states, local governments, and private landowners to apply for an Incidental Take Permit for otherwise lawful activities that may harm species

that is listed, or proposed for listing, or their habitats. To obtain a permit, an applicant must submit a Habitat Conservation Plan indicating what will be done to minimize and mitigate the impact of the permitted take on listed species.

Natural Community Conservation Planning Act

As set forth in the California Department of Fish and Game Code (§2800 et seq), the CDFG may enter into an agreement with any person, local, state, or federal agency to provide comprehensive management of multiple wildlife species. These large-scale natural resource conservation plans, known as natural community conservation plans, must identify and provide for area wide protection and perpetuation of natural wildlife diversity. The developed plans are intended to allow for growth that is compatible with necessary preservation, and includes a provision specifying the amount, if any, payable to the CDFG.

4.5.2.2 Local Laws and Regulations

American River Parkway Plan

The goals of the American River Parkway Plan include to "preserve, protect, interpret and improve" the ability of the parkway to support migratory and resident wildlife and diverse natural vegetation.

Policy 4.10 states, "flood control projects, including levee protection projects and vegetation removal for flood control purposes, shall be designed to avoid or minimize adverse impacts on the Parkway, including impacts to wildlife and wildlife corridors." When adverse impacts are found to be unavoidable, "appropriate feasible compensatory mitigation shall be part of the project." These mitigation measures are required to be close to the affected site, unless undesirable impacts are created through such a location.

All plantings in the parkway are required to be consistent with an approved list of native vegetation, approved by the Recreation and Parks Commission. Activities such as brush clearing and mowing of natural vegetation are permitted where necessary "to protect the public's health, safety, or for the purpose of habitat restoration."

The plan permits the removal of non-native trees and shrubs if any of the following criteria are met: they constitute a hazard; the removal is part of on-going normal maintenance practice; or the vegetation was approved for removal as part of a discretionary project.

City of Sacramento General Plan

The Environmental Resources section of the Draft 2030 General Plan for the City of Sacramento protects biological resources through enhancement and the sustaining of open space, natural areas, vegetation, and wildlife. Policy ER 2.1.5 states that the "city shall preserve the ecological integrity of riparian areas, creek corridors, and other drainages that support biological resources, and contribute to the overall health of the watershed through the preservation of native plants and the removal of invasive, non-native plants. If adverse impacts to these resources are unavoidable, they shall be mitigated on an in-kind basis."

The City of Sacramento further strives to preserve, protect, and avoid impacts to wildlife corridors, with replacement of equivalent value habitat required to mitigate adverse effects (ER 2.1.9).

City of West Sacramento General Plan

The General Plan states the goals of the city, which include supporting state and federal preservation policies and requiring the completion of site-specific surveys when projects are located in or near riparian areas. The city supports mitigation measures which provide for no net loss of riparian or wetland habitat acreage. In addition, the city supports the use of native vegetation for landscaping roadsides, parks, and private properties, especially along the Sacramento River and areas adjacent to riparian and wetland habitats.

The City of West Sacramento encourages the maintenance of marsh and riparian vegetation along the Deep Water Ship Channel, which borders Sac 57.2R, under the condition that routine maintenance and clearing disturb only one bank per year and maintain the fringes of marsh vegetation.

City of West Sacramento Tree Preservation Ordinance

Landmark and heritage trees are protected under the City of West Sacramento's Municipal Code, Title 8, Chapter 24. A permit is required to remove or trim any branch over 5 inches DBH on a heritage tree. Heritage trees are those living trees with a circumference of 75 inches DBH or more, or any living oak with a circumference of 50 inches DBH or more. Trenching, grading, paving, or parking vehicles within the drip line of a heritage tree also require permits under the ordinance.

Tree permits require the applicant to replace a heritage tree that must be removed with a living tree on the property or within the city of West Sacramento in a location approved by the tree administrator. The applicant must replace the tree and continue to replace the replacement tree if the tree dies any time within 3 years of the initial planting. Replacement is not required if a tree is removed because it poses a risk or if the tree hosts a plant parasite.

Replacement trees are required at the ratio of 1-inch diameter of replacement plant for every 1-inch diameter of tree removed. Replacement trees may be a combination of 15-gallon-size trees, which are the equivalent of a 1-inch diameter tree, or 24-inch box trees, which are the equivalent of a 3-inch-diameter tree. If trees cannot be replaced on site, the applicant must pay an in-lieu fee, which will be used to purchase and plant trees elsewhere in the city of West Sacramento.

City of Yuba City General Plan

Guiding policies of the Yuba City General Plan are intended to enhance the open space features of the Feather River. Where feasible, restoration of degraded open space areas in the Feather River Parkway planning area to environmentally valuable and sustainable conditions is encouraged. As part of the Feather River Parkway Plan, Policy 8.4-I-4 requires measures to protect and enhance riparian zones, natural areas, and wildlife qualities, as well as establish and maintain a protection zone of no development along the river. The only development permitted in the protection zone will be parkway enhancement projects (trails).

For park improvements, a buffer zone is required along the river in which no grading or construction activities occur. Restoration plans should include performance standards and contingency plans if re-planting is not successful. Oak trees and other trees of significant size must be incorporated into site designs to the maximum extent feasible.

Glenn County General Plan

The Glenn County General Plan recognizes the Sacramento River corridor as an area of significant biological importance. The general plan establishes policies to preserve areas or systems that benefit a variety of species. Natural riparian habitat is specifically protected under NRP-41.

Sutter County General Plan

Preservation of areas of natural vegetation is encouraged through policy 4.D-1 of the General Plan.

Sacramento County General Plan

The American River Parkway and several areas along the Sacramento River are identified as critical natural areas in the general plan. LAR 0.3L and LAR 2.8L are within the American River Parkway and Sac 16.8L is upstream of a small designated area.

Sacramento County Tree Preservation and Protection Ordinance

Public trees, which occur on any county owned lands and/or within certain right-of-way situations, require a permit for removal and pruning.

Yolo County General Plan

The Open Space element of the Yolo County General Plan sets the goal of achieving no net loss of riparian habitat.

4.5.3 Environmental Effects

Effects on vegetation and wildlife would be considered significant if construction or maintenance of the Proposed Alternative would:

- Interfere with the movement of any resident or migratory wildlife species;
- Result in the substantial loss, degradation, or fragmentation of any natural plant communities and wildlife habitat; or
- Substantially diminish habitat for any fish life stage or result in displacement of spawning fish such that year-class strength is substantially reduced.

4.5.3.1 Alternative 1: Proposed Action

The proposed bank protection measures would include: (1) protecting the toe and upper slopes of the bank with riprap; (2) establishing a bench around the MSWL to provide aquatic habitat during higher river stages in winter and spring; (3) placing anchored IWM for aquatic habitat; and (4) planting pole and container plantings to stabilize the bank and provide riparian and shaded riverine aquatic habitat.

Approximately 18.47 acres of the project area (6.06 acres above MSWLs and 12.42 acres below MSWLs) will be directly affected (i.e., covered with rock revetment and soil) by construction activities at the erosion sites. The project would remove a total of 0.17 acres of emergent vegetation from Sac 16.8, SB 16.6R, CS 21.8R and Sac 177.8. The project would create 1.1 acres of vegetated shallows at erosion sites Sac 16.8, SB 16.6R, CS 21.8R, F 28.5 and Sac 52.3. These disturbances would include increased noise levels from generators, staging areas, vehicles, and river barges. Temporary displacement of local wildlife

populations due to increased human presence is likely to occur during construction activities.

The proposed action would result in both temporary and long term impacts on riparian forest, riparian scrub, ruderal, and open water habitats within the project footprint at each of the erosion sites. The proposed alternative incorporates the construction of riparian benches and plantings, as well as re-seeding with native plants. Therefore, although the project would result in temporary, direct disturbance to vegetation, and indirect disturbance to habitat, these values would eventually be restored. The duration of the impacts is dependent on habitat type and species. Temporary impacts- to riparian forest are assumed to be 5 to 10 years, while impacts to riparian scrub are expected to persist for 2 to 4 years.

The Sacramento River channel and bank would be affected by construction of the bank protection project. Potential short-term effects of the proposed project on non-special-status fish species are expected to be the same as those described for the levee repair activities of the Alternatives 2 and 3. However, implementation of the mitigation measures and BMPs described below would avoid or minimize short-term adverse impacts on non-special-status fish and the effects would therefore be less than significant. Long-term effects of the proposed bank protection project on non-special-status fish would also be less than significant, as the proposed alternative includes engineered habitat features at many sites and implementation of BMPs would protect or create habitat for some non-special-status fish species.

Site preparation activities may include some trimming or pruning of trees and shrubs. Plant species recognized as “pest plants” (e.g., giant reed, black locust) by Cal-IPC would be removed to improve habitat quality. There would be no grubbing or contouring of the sites. All fill materials would be placed on existing, undisturbed ground with no excavation or movement of site materials.

Ruderal vegetation is anticipated to be most severely affected by the proposed repair work on the erosion sites. This is due to the overall large percentage of the sites that are composed of this vegetation type, and the necessity of placing fill and rock revetment over the surface currently supporting these species. Completed sites will be seeded with a specially formulated mix of native ruderal species. Since these species are relatively quick growers, the ruderal vegetation cover is expected to be fully restored within the first several years following repair and restoration activities.

Construction activities may result in the loss of heritage trees and native oaks, as well as indirect effects associated with pruning and fill placement around the root crown. Disturbance or removal of protected trees would be considered a significant impact.

The exact linear feet of vegetation that may need to be removed at each site cannot be specified until time of construction due to changing site conditions from ongoing erosion. Existing IWM would remain in the river and be covered with rock, effectively anchoring the material in place.

Initial (Year 0) shade values were conservatively estimated at 25% of existing conditions due to a combination of two factors. First, the bank fill projects serve to shift the bank line intersection of the seasonal water surfaces towards the channel centerline and away from the existing vegetation. Second, rock placement will remove all mid- and low-canopy shade that remains. Therefore, the combined shade of existing and planted trees means that little or no

riparian shade would be present for several years (i.e., 3 to 5) following initial repair efforts. However, in the longer-term, expected increases in canopy widths of both existing trees and shrubs and those planted on the constructed benches and upper slopes, would eventually result in improved SRA values.

The effects to vegetation and wildlife are temporary and will be less than significant once the mitigation measures described below are implemented.

4.5.3.2 Alternative 2: Thin Rock Armor

As in the preferred alternative, there would be no grubbing of the site. All fill materials would be placed on existing, undisturbed ground. Alternative 2 does not address slope stability issues and because bank slopes would not be reduced, mid-term (i.e. ~25 years) levee failures are possible. Noise disturbance, caused by generators, vehicles, and construction equipment associated with the proposed repair work may result in temporary displacement of local wildlife populations.

The work would result in both temporary and long term impacts on riparian forest, riparian scrub, ruderal, and open water habitats within the project footprint at each of the erosion sites. The project would result in direct disturbance to vegetation, and indirect disturbance to habitat, that would only be restored through gradual re-colonization (i.e., secondary ecological succession) of the site. Because non-native ruderal species have life cycle strategies and seed dispersal mechanisms that are better adapted in colonizing bare substrates, this habitat assemblage is expected to be the dominant cover type within the erosion sites. The impact to riparian vegetation as a result of this project is considered significant.

Toxic substances used at construction sites, including gasoline, lubricants, and other petroleum-based products could enter the Sacramento River as a result of spills or leakage from machinery or storage containers. These substances can kill aquatic organisms through exposure to lethal concentrations. Exposure to non-lethal levels can cause physiological stress and increased susceptibility to other sources of mortality. Although unlikely, direct mortality of individuals could also occur as a result of in-water construction activities such as placement of rock revetment.

Construction activities may result in the loss of heritage trees and native oaks, as well as indirect effects associated with pruning and fill placement around the root crown. Disturbance or removal of protected trees would be considered a significant impact.

Because large trees would, to the greatest extent possible, be preserved onsite, IWM would be left in place, and the bankline would not be substantially built out (preserving the existing H:V ratios on the sites), there would not be a significant impact to the existing SRA provided by the erosion sites.

4.5.3.3 Alternative 3: No Action

The potential adverse effects of the No Action alternative on non-special status fish would primarily result from complete levee failure that would potentially result in transport of fish out of the Sacramento River into areas where they are likely to become stranded, as well as post-failure levee repair measures that would include both short-term construction-related effects and longer-term effects on habitat. Short-term adverse effects of post-failure levee

repair could include increases in turbidity and suspended sediment that may disrupt feeding activities or result in temporary displacement of individuals from preferred habitats. High concentrations of suspended sediment can also bury stream substrates that provide habitat for aquatic invertebrates, an important food source for many fish species.

Flooding during a levee break would likely entrain toxic substances into the water, including gasoline, lubricants, insecticides, pesticides, sewage, and other petroleum-based products, that could enter the Sacramento River. These substances can kill aquatic organisms through exposure to lethal concentrations. Exposure to non-lethal levels can cause physiological stress and increased susceptibility to other sources of mortality. Although unlikely, direct mortality of individuals could also occur as a result of in-water construction activities such as placement of rock revetment during repair of any breached levees.

Longer-term adverse effects could include reduced near-shore habitat value for spawning, incubating, rearing, and adult life stages of non-special-status fish. These effects would result from addition of rock revetment and removal or burial of riparian and emergent vegetation at emergency bank repair locations.

Because BMPs and mitigation measures may not be implemented for post-failure emergency bank repair actions that could occur under the No Action alternative, avoiding the short-term and long-term effects described above would be difficult. However, impacts on non-special-status fish species under the No Action alternative are not considered significant because the populations of these species are generally large and the potential effects on the population are minor.

4.5.4 Mitigation

The proposed project is a cooperative effort of state and federal agencies, and does not have a municipal sponsor.The design of the erosion repair sites would include necessary onsite mitigation planting of native vegetation to replace the value of anticipated vegetation and associated habitat(s), including impacts to any “heritage trees” that may occur within a particular erosion site, that may be lost in the construction process. However, the project would not be subject to the exact standards of local municipal codes

To avoid potentially significant impacts to bird species protected under the MBTA, a qualified biologist shall conduct a pre-construction breeding-season survey (approximately March through August) of the erosion sites during the same calendar year that construction is planned to begin. The survey shall determine if any birds are nesting on or directly adjacent to the project site. Where feasible, direct disturbance of nest sites (including removal of nest trees and activities in the immediate vicinity of active nests) shall be avoided during the breeding season. Appropriate “no disturbance” buffers shall be established near any identified active nest sites. The size and configuration of buffers will be based on the proximity of active nests to construction, existing disturbance levels, topography, the sensitivity of the species, and other factors established through coordination with CDFG representatives on a case-by-case basis.

The retention of existing IWM and the installation of additional IWM would effectively retain and create fisheries habitat and more IWM recruitment and retention during winter and spring flows. All branches, limbs, and twigs, would be retained to the extent practical to maintain the size, volume, and complexity of IWM. The trees would be anchored by

placement of rock so as not to create a hazard for boaters or swimmers at low MSWLs. Signage may also be placed if necessary.

The design of the erosion repair sites would include necessary onsite mitigation. Replacement of existing ruderal habitats with reconstructed riparian plantings using native plant materials within the erosion sites is anticipated to exceed existing habitat values, thus fulfilling replacement goals and objectives (e.g., no net loss of riparian habitat) presented in the various General Plans previously discussed in this section. No mitigation beyond what is incorporated into the project description is required for impacts on vegetation and wildlife, and potential adverse impact as a result of the proposed project are considered less-than-significant.

The USACE would require the contractor to submit to the Regional Water Quality Control Board (RWQCB) a notice of intent to discharge stormwater before the beginning of construction activities; development and implementation of a storm water pollution prevention plan (SWPPP), as required by the conditions of a National Pollutant Discharge Elimination System (NPDES) permit. The USACE would prepare a SWPPP that identifies BMPs for discharges (Section 4.8.4). The SWPPP would include a 401 permit, an erosion control and restoration plan, a water quality monitoring plan, a hazardous materials management plan, and post-construction BMPs. The BMPs would be maintained until all areas disturbed during construction have been adequately revegetated and stabilized.

The specific BMPs that would be incorporated into the SWPPP would be determined during the final stages of project design. However, the SWPPP would include one or more of the following standard practices, which are commonly used during the construction and post-construction phases of levee improvement projects.

- Conduct earthwork during July through November, which are relatively dry months (see Section 2.5).
- Stage construction equipment and materials on the landside of the subject levee reaches. To the extent possible, stage equipment and materials in areas that have already been disturbed.
- Minimize ground and vegetation disturbance during project construction by establishing designated equipment staging areas, ingress and egress corridors, spoils disposal and soil stockpile areas, and equipment exclusion zones prior to the commencement of any grading operations.
- Stockpile soil and grading spoils on the landside of the subject levee reaches, and install sediment barriers (e.g., silt fences, fiber rolls, straw bales) around the base of stockpiles to intercept runoff and sediment during storm events. If necessary, cover stockpiles with geotextile fabric to provide further protection against wind and water erosion.
- Install sediment barriers on graded or otherwise disturbed slopes as needed to prevent sediment from leaving the erosion sites and entering nearby surface waters.
- Use and store hazardous materials, such as vehicle fuels and lubricants, in designated staging areas located away from surface waters. Implement a spill prevention and control plan that specifies measures that will be used to prevent, control, and clean up hazardous material spills.

- Install plant materials to stabilize cut and fill slopes and other disturbed areas once construction is complete. Plant materials may include an erosion control seed mixture or shrub and tree container stock. Temporary structural BMPs, such as sediment barriers, erosion control blankets, mulch, and mulch tackifier, may be installed as needed to stabilize disturbed areas until vegetation becomes established. Implementation of the BMPs specified in the erosion control plan and SWPPP would substantially reduce the potential for accelerated erosion and sedimentation to occur as a result of construction-related ground and vegetation disturbance.

With the implementation of the mitigation measures described above, the proposed project would not have substantial adverse effects on non-special-status fish or their habitat, or interfere with their movement. The project would not conflict with the provisions of any Habitat Conservation Plan or Natural Community Conservation Plan for non-special-status fish. As a result, potential effects due to the proposed project (compared to the No Action alternative) would be less than significant for non-special-status fish, wildlife, or vegetative species.

4.6 Special Status Species

This section describes the special-status species, specifically federal and state listed species and candidate species, which may be present or have the potential to occur at the various erosion sites.

For the purposes of this document, special status species include:

- species listed, proposed, or candidate species for listing as Threatened or Endangered by the United States Fish and Wildlife Service (USFWS) pursuant to the federal ESA of 1973, as amended;
- species listed as Rare, Threatened, or Endangered by the CDFG pursuant to the California Endangered Species Act (CESA) of 1970, as amended;
- species designated as Fully Protected under Sections 3511 (birds), 4700 (mammals), and 5050 (reptiles and amphibians) of the California Fish and Game Code;
- species designated by the CDFG as California Species of Special Concern;
- plant species listed as Category 1B and 2 by the California Native Plant Society (CNPS); and
- species not currently protected by statute or regulation, but considered rare, threatened or endangered under CEQA (Section 15380).

4.6.1 Environmental Setting

Special-status species that have the potential to occur in the vicinity of the erosion sites were determined through a literature review and electronic queries of various sources including the CDFG's *California Natural Diversity Database* (CNDDB), CNPS's *Electronic Inventory of Rare and Endangered Plants*, and the USFWS's *Electronic Species List* (the results of these queries are available for review in Appendix G). For each of the sites, special status species occurrence was considered if a species had been previously recorded as occurring either within the same United States Geological Survey's (USGS's) 7.5 minute topographic quadrangle as a site or any of the surrounding eight quadrangles, or within the same county

as the erosion site. Table 4-6 is a site-by-site listing of all counties and quadrangles searched.

Table 4-5 USGS Quadrangles and Counties Queried for Special-Status Species

Erosion Site	Quadrangle Name	County	Surrounding Quadrangles
SB 16.6R	Rio Vista	Solano	Liberty Island, Dozier, Birds Landing, Antioch North, Jersey Island, Bouldin Island, Isleton, Courtland
CS 21.8R	Liberty Island	Solano	Saxon, Dixon, Dozier, Birds Landing, Rio Vista, Isleton, Courtland, Clarksburg
Sac 49.7L	Clarksburg	Sacramento	Sacramento West, Davis, Saxon, Liberty Island, Courtland, Bruceville, Florin, Sacramento East
Sac 52.3L	Sacramento West	Sacramento	Taylor Monument, Gray's Bend, Davis, Saxon, Clarksburg, Florin, Sacramento East, Rio Linda
LAR 0.3L	Sacramento West	Sacramento	Taylor Monument, Gray's Bend, Davis, Saxon, Clarksburg, Florin, Sacramento East, Rio Linda
LAR 2.8L	Sacramento East	Sacramento	Rio Linda, Taylor Monument, Sacramento West, Clarksburg, Florin, elk Grove, Carmichael, Citrus Heights
Sac 53.5R	Sacramento West	Yolo	Taylor Monument, Gray's Bend, Davis, Saxon, Clarksburg, Florin, Sacramento East, Rio Linda

Erosion Site	Quadrangle Name	County	Surrounding Quadrangles
Sac 177.8R	Glenn	Glenn	Llano, Ord Ferry, Hamilton City, Orland, Willows, Logandale, Princeton, Butte City
Sac 16.8L	Isleton	Sacramento	Courtland, Liberty Island, Rio Vista, Jersey Island, Bouldin Island, Terminous, Thorton, Bruceville
Sac 42.7R	Clarksburg	Yolo	Sacramento West, Davis, Saxon, Liberty Island, Courtland, Bruceville, Florin, Sacramento East
Sac 55.2 L	Sacramento West	Sacramento	Taylor Monument, Gray's Bend, Davis, Saxon, Clarksburg, Florin, Sacramento East, Rio Linda
Sac 77.2L	Verona	Sutter	Nicolaus, Sutter Causeway, Knights Landing, Gray's Bend, Taylor Monument, Rio Linda, Pleasant Grove, Sheridan
F 28.5R	Yuba City	Sutter	Sutter, Gilsizer Slough, Olivehurst, Wheatland, Brown's Valley, Loma Rica, Honcut

Appendix G includes a comprehensive table of all special status species occurrences retrieved through this query of the CDFG, CNPS, and USFWS lists and indicates the species' current regulatory status, habitat association, and potential for occurrence on or near the various erosion sites, as well as the original electronic query results. Information gathered during the field surveys and data on range, habitat requirements, and recorded occurrences were used to refine the species lists to determine which species could potentially occur on, or within a 5 mile radius of, the erosion sites, and which are likely to utilize the habitats present.

A list of 197 special-status species was generated by the CNDDB, CNPS, and USFWS queries. Of these 197 species, 27 occur or have the potential to occur within the 13 erosion sites. These species include: green sturgeon (*Acipenser medirostris*), Delta smelt (*Hypomesus transpacificus*), Central Valley steelhead (*Oncorhynchus mykiss*), Central

Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*), winter-run Chinook salmon (*Oncorhynchus tshawytscha*), Sacramento splittail (*Pogonichthys macrolepidotus*), valley elderberry longhorn beetle (VELB; *Desmocerus californicus dimorphus*), northwestern pond turtle (*Actinemys marmorata marmorata*), Cooper's hawk (*Accipiter cooperii*), great egret (*Ardea alba*), great blue heron (*Ardea herodias*), Swainson's hawk (*Buteo swainsoni*), western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), snowy egret (*Egretta thula*), white-tailed kite (*Elanus leucurus*), black-crowned night heron (*Nycticorax nycticorax*), osprey (*Pandion haliaetus*), double-crested cormorant (*Phalacrocorax auritus*), bank swallow (*Riparia riparia*), western red bat (*Lasiurus blossevillii*), hoary bat (*Lasiurus cinereus*), California black walnut (*Juglans californica* var. *hindsii*), Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*), Mason's lilaeopsis (*Lilaeopsis masonii*), Delta mudwort (*Limosella subulata*), Sanford's arrowhead (*Sagittaria sanfordii*), marsh skullcap (*Scutellaria galericulata*), and Suisun Marsh aster.

The CDFG also maintains a list of ecologically sensitive and/or threatened habitat types within the state of California. Riparian habitats within the Central Valley (i.e., Great Valley Cottonwood Forest, Great Valley Mixed Riparian Forest, and Great Valley Valley Oak Riparian Forest) are recognized by the CDFG as *sensitive natural community types*.

4.6.1.1 Special Status Fish Species

Sacramento River winter-run Chinook salmon

The Sacramento River winter-run Chinook salmon evolutionarily significant unit (ESU) was listed as endangered under CESA and threatened under the federal ESA in 1989 (54 FR 32085). After several years of low escapements, NMFS subsequently upgraded the federal listing to endangered in 1994 (59 FR 440). NMFS designated critical habitat for Sacramento River winter-run Chinook salmon in 1993 (58 FR 33213).

Sacramento River winter-run Chinook salmon spend 1 to 3 years in the ocean. Adult Sacramento River winter-run Chinook salmon leave the ocean and migrate through the Sacramento-San Joaquin Delta into the Sacramento River from December through July, with peak migration in March. Adults spawn from mid-April through August (Moyle 2002). Egg incubation continues through October. The primary spawning habitat in the Sacramento River is above Red Bluff Diversion Dam at RM 243, although spawning has been observed downstream as far as RM 218 (NMFS 2001). Spawning success below the Red Bluff Diversion Dam may be limited primarily by warm water temperatures (Hallock and Fisher 1985, Yoshiyama et al. 1998).

Downstream movement of juvenile Sacramento River winter-run Chinook salmon begins in August soon after fry emerge. The peak abundance of juveniles moving downstream occurs at Red Bluff in September and October (Vogel and Marine 1991). Juvenile Chinook salmon move downstream from spawning areas in response to many factors, which may include inherited behavior, habitat availability, flow, competition for space and food, and water temperature. The number and timing of juvenile movements are highly variable. Storm events and the resulting high flow and turbidity appear to trigger downstream movement of substantial numbers of juvenile Chinook salmon.

Sacramento River winter-run Chinook salmon smolts (i.e., juveniles that are physiologically ready to enter seawater) may migrate through the delta and bay to the ocean from November

through May (Yoshiyama et al. 1998). In general, juvenile abundance in the delta increases in response to increased Sacramento River flow (Brandes and McLain 2001). The Sacramento River channel is the main migration route through the delta. However, the Yolo Bypass also provides significant outmigration passage during higher flow events.

During winter in the Sacramento-San Joaquin system, juveniles rear on seasonally inundated floodplains. Sommer et al. (2001) found higher growth and survival rates of juvenile Chinook salmon that reared on the Yolo Bypass floodplain compared with those that reared in the mainstem Sacramento River.

The Sacramento River is considered to be critical habitat for winter-run Chinook salmon. Critical habitat includes the water column, river bottom, and adjacent riparian zone which fry and juveniles use for rearing. The erosion sites in the delta and along the Sacramento River up to Sac 42.7R have the potential to support both recruitment and survival of juveniles and adults.

Central Valley spring-run Chinook salmon

The Central Valley spring-run Chinook salmon ESU was federally listed as threatened on September 16, 1999 (64 FR 50393). The threatened status of Central Valley spring-run Chinook salmon was reaffirmed in NMFS' final listing determination issued on June 28, 2005 (70 CFR 37160). Critical habitat for Central Valley spring-run Chinook salmon was designated by NMFS on September 2, 2005 (70 FR 52488).

Adult Central Valley spring-run Chinook salmon enter the mainstem Sacramento River from March through September, with the peak upstream migration occurring from May through June (Yoshiyama et al. 1998). Central Valley spring-run Chinook salmon are sexually immature during upstream migration, and adults hold in deep, cold pools near spawning habitat until spawning commences in late summer and fall. Central Valley spring-run Chinook salmon spawn in the upper reaches of the mainstem Sacramento River and tributary streams (Myers et al. 1998), with the largest tributary runs occurring in Butte, Deer, and Mill creeks (Yoshiyama et al. 1998). Spawning typically begins in late August and may continue through October. Juveniles emerge in November and December in most locations, but may emerge later when water temperature is cooler. Newly emerged fry remain in shallow, low-velocity edgewater (CDFG 1998).

Juvenile Central Valley spring-run Chinook salmon have highly variable rearing and outmigration patterns, with juveniles rearing anywhere from 3 to 15 months before outmigrating to the ocean (Fisher 1994). Scale analyses indicate that most returning adults (> 90%) have emigrated as subyearlings (Myers et al. 1998). Rearing takes place in their natal streams, the mainstem of the Sacramento River, inundated floodplains (including the Sutter and Yolo bypasses), and the delta. Based on observations in Butte Creek and the Sacramento River, young-of-year juveniles typically migrate from November through May. Yearling Central Valley spring-run Chinook salmon migrate from October to March, with peak migration in November (S. P. Cramer and Associates 1997, Hill and Webber 1999). Downstream migration of yearlings typically coincides with the onset of the winter storm season, and migration may continue through March (CDFG 1998).

Central Valley spring-run Chinook salmon occur at the erosion sites, either as adults migrating upstream to their spawning habitat, or as juveniles, rearing and migrating towards

the ocean. All rivers and sloughs in the SRBPP action area are designated as critical habitat and erosion sites may provide suitable habitat for this species.

Central Valley fall-/late fall-run Chinook salmon

Central Valley fall-/late fall-run Chinook salmon ESU is not listed under the CESA or the ESA, but is classified by NMFS as a species of concern (69 FR 19975) and considered a California species of special concern. Central Valley fall-/late fall-run Chinook salmon occur at the erosion sites, either as adults migrating upstream to their spawning habitat, or as juveniles and smolts, rearing and migrating towards the ocean.

Adult Central Valley fall-run Chinook salmon migrate into the Sacramento River and its tributaries from June through December in mature condition and spawn from late September through December, soon after arriving at their spawning grounds (Yoshiyama et al. 1998). The spawning peak occurs in October and November. Emergence occurs from December through March, and juveniles migrate downstream through the delta and out to the ocean soon after emerging, rearing in fresh water for only a few months. Smolt outmigration typically occurs from March through July (Yoshiyama et al. 1998).

Late Central Valley fall-run Chinook salmon migrate upstream before they are sexually mature, and hold near the spawning grounds for 1 to 3 months before spawning. Upstream migration takes place from October through April and spawning occurs from late January through April, with peak spawning in February and March (Yoshiyama et al. 1998). Fry emerge from their redds from April through June. Juvenile Central Valley late fall-run Chinook salmon rear in their natal stream during the summer, and remain throughout the year in some streams. Smolt outmigration can occur from November through May (Yoshiyama et al. 1998).

Central Valley fall-/late fall-run Chinook salmon occur at the erosion sites, either as adults migrating upstream to their spawning habitat, or as juveniles and smolts, rearing and migrating towards the ocean.

Central Valley steelhead

Central Valley steelhead distinct population segment (DPS) was federally listed as threatened on March 19, 1998 (63 FR 13347). This listing was reaffirmed in NMFS final listing determination on January 5, 2006 (71 FR 834), and critical habitat for Central Valley steelhead was designated on February 16, 2000 (65 FR 7764).

Central Valley steelhead ranged throughout the tributaries of the Sacramento and San Joaquin rivers prior to the dam construction, water development, and watershed perturbation of the 19th and 20th centuries. Wild stocks are now mostly confined to the upper Sacramento River downstream of Keswick Dam; upper Sacramento River tributaries such as Deer, Mill, and Antelope creeks; and the Yuba River downstream of Englebright Dam. The abundance of naturally reproducing Central Valley steelhead, as measured by the number of adults returning to spawn, is largely unknown. Natural escapement in 1995 was estimated to be about 1,000 adults each for Mill and Deer creeks and the Yuba River (S.P. Cramer and Associates 1995). Hatchery returns have averaged around 10,000 adults (Mills and Fisher 1994). The most recent annual estimate of adults spawning upstream of Red Bluff Diversion Dam is less than 2,000 fish (71 FR 834).

Steelhead have one of the most complex life histories of any salmonid species, exhibiting

both anadromous and freshwater resident life histories. Freshwater residents typically are referred to as rainbow trout, and those exhibiting an anadromous life history are called steelhead. Steelhead exhibit highly variable life history patterns throughout their range, but are broadly categorized into winter and summer reproductive ecotypes. Winter steelhead, the most widespread reproductive ecotype and the only type currently present in Central Valley streams (McEwan and Jackson 1996) become sexually mature in the ocean; enter spawning streams in summer, fall, or winter; and spawn later in winter or late spring (Meehan and Bjornn 1991, Behnke 1992).

In the Sacramento River, adult winter steelhead migrate upstream during most months of the year, beginning in July, peaking in September, and continuing through February or March. Spawning occurs primarily from January through March, but may begin as early as late December and may extend through April (Hallock 1987). Individual steelhead may spawn more than once, returning to the ocean between each spawning migration.

Juvenile steelhead rear a minimum of one, and typically two or more years in fresh water before migrating to the ocean during smoltification (the process of physiological change that allows ocean survival). Juvenile migration to the ocean generally occurs from December through August. The peak months of juvenile migration are January to May (McEwan 2001). The importance of main channel and floodplain habitats to steelhead in the lower Sacramento River and upper delta is not well understood. Steelhead smolts have been found in the Yolo Bypass during the period of winter and spring inundation (T. Sommer, pers. comm. 2002), but the importance of this and other floodplain areas in the lower Sacramento River and upper delta is not yet clear.

Central Valley steelhead are known to occur in the waters adjacent to the erosion sites. The importance of the main channel and floodplain in the lower Sacramento River and delta are currently not well understood; however, all erosion sites are within designated critical habitat for this species.

Delta smelt

Delta smelt were federally listed as threatened on March 5, 1993 (58 FR 12854) and critical habitat was designated on December 19, 1994 (59 FR 65256). Delta smelt are endemic to the Sacramento-San Joaquin estuary and are found seasonally in Suisun Bay and Suisun Marsh (Moyle 2002).

Delta smelt are typically found in shallow water (<10 feet) where salinity ranges from 2 to 7 parts per thousand (ppt), although they have been observed at salinities between 0 and 18.4 ppt (Moyle 2002). Delta smelt abundance and geographic distribution are dependent upon freshwater outflows and the salinity of the San Francisco Estuary and delta (Moyle 2002, Bennett 2005). In the Sacramento River they have been documented upstream to the City of Sacramento (RM 60), but they are typically restricted to the delta and the lower Sacramento River downstream of RM 20. During periods of high river outflow, delta smelt distribution extends from the lower Sacramento River into Suisun Bay, whereas during low flow periods they occur farther upstream, concentrating in the upper delta and lower Sacramento River. Delta smelt have relatively low fecundity and most live for 1 year. They feed on planktonic copepods, cladocerans, amphipods, and insect larva (Moyle 2002).

Delta smelt are semi-anadromous. During their spawning migration, adults move into the

freshwater channels and sloughs of the delta between December and January. Spawning occurs between January and July, with peak spawning from April through mid-May (Moyle 2002). Spawning locations in the delta have not been identified and are inferred from larval catches (Bennett 2005). Larval fish have been observed in Montezuma Slough (Wang 1986), Suisun Slough in Suisun Marsh (Moyle 2002), the Napa River estuary (Stillwater Sciences 2006), the Sacramento River above Rio Vista, and Cache, Lindsey, Georgiana, Prospect, Beaver, Hog, Sycamore, and Barker sloughs (USFWS 1996). Spawning was also observed in the Sacramento River up to Garcia Bend (RM 50) during drought conditions as a result of increased salt water intrusion that moved delta smelt spawning and rearing farther inland (Wang and Brown 1993). Laboratory experiments have found eggs to be adhesive and demersal, and usually attached to substrate likely composed of gravel, sand, or other submerged material (Moyle 2002, Wang 1991). Hatching takes approximately 9 to 13 days, and larvae begin feeding 4 to 5 days later (Moyle 2002). Newly hatched larvae contain a large oil globule that makes them semi-buoyant and allows them to stay near the bottom. As their fins and swim bladder develop, they move higher into the water column and are washed downstream to the open waters of the estuary (Moyle 2002).

Delta smelt may be present at all of the erosion sites, except Sac 77.2L and Sac 177.8R, throughout their life cycle. Although it is uncertain if delta smelt would be present at sites upstream of RM 60, analysis of the effects at sites Sac 77.2L and Sac 177.8R is included for the purpose of this evaluation.

Longfin smelt

Occurrences of longfin smelt (*Spirinchus thaleichthys*) do not currently appear on CDFG or USFWS database searches, because the fish is not yet listed at either the state or federal level. A petition to CDFG supporting the listing of this species under CESA was filed in August of 2007 by the Bay Institute.

Longfin smelt were historically one of the most abundant of the pelagic fishes in the San Francisco Bay-Delta Estuary (Bay Institute 2007). They were petitioned for listing under ESA in 1992, at which time the USFWS found listing unwarranted (USFWS 1994). On August 8, 2007 the USFWS was petitioned to list the longfin smelt as endangered. On February 7, 2008 the CDFG voted to adopt protection for longfin smelt under CESA, giving it the same protections as threatened species. By August 2008, the state is expected to make a final decision on the listing (Kay 2008). The abundance of longfin smelt is positively correlated with high outflows into Suisun Bay and San Pablo Bay, which provide better rearing habitat than areas farther upstream. The primary cause of population decline over the past couple of decades has been due to water exports and diversions of the Sacramento-San Joaquin Delta (Bay Institute 2007).

Sacramento River longfin smelt are estuarine fish that are geographically isolated from all other longfin smelt populations (USFWS 1996). Throughout their life cycle, the longfin smelt prefer the open waters along the Sacramento River estuary. The adults aggregate in Suisun Bay, Montezuma Slough, and the western delta in late fall, and then spawn in freshwater areas immediately upstream during winter and early spring. They have been known to spawn as early as November and as late as June, with peak spawning between February to April (Wang 1986). Longfin smelt typically have a two year life cycle. They reach sexual maturity just before the second year, and most die after spawning. Exact

locations and environmental conditions of spawning sites in the San Francisco Bay-Delta are undocumented. It may be likely that longfin smelt deposit their eggs on cobble or plant substrates at the bottom of deep channel habitats based on their behavior in other water bodies (Chigbu 2000). Juveniles emerge approximately 40 days after spawning. Larvae are frequently caught upstream of the Sacramento-San Joaquin River confluence in the delta and then become widely dispersed throughout the upper estuary.

Potential longfin smelt habitat encompasses the lower portion of the Sacramento River system including Sites SB 16.6R, CS 21.8R, Sac 16.8L, Sac 42.7R, and Sac 49.7L

Green sturgeon

Green sturgeon were determined by NMFS to be comprised of two populations, a northern and a southern DPS (68 FR 4433). The southern DPS of green sturgeon was listed as threatened under the federal ESA on April 7, 2006 (71 FR 17757) and classified as a Class 1 Species of Special Concern by the CDFG in 1995 (Moyle et al. 1995). Critical habitat has not been designated. The Sacramento River supports the southernmost spawning population of green sturgeon (Moyle 2002).

The green sturgeon is anadromous, but it is the most marine-oriented of the sturgeon species and has been found in nearshore marine waters from Mexico to the Bering Sea (70 FR 17386). The northern DPS supports known spawning populations in the Rogue, Klamath, and Eel Rivers; the southern DPS has a single spawning population in the Sacramento River (NMFS 2005c). Adults typically migrate upstream into rivers between late February and late July. Spawning occurs from March to July, with peak spawning from mid-April to mid-June. Green sturgeon are believed to spawn every 3 to 5 years, although recent evidence indicates that spawning may be as frequent as every 2 years (NMFS 2005c). Little is known about the specific spawning habitat preferences of green sturgeon. Adult green sturgeon are believed to broadcast their eggs in deep, fast water over large cobble substrate where the eggs settle into the interstitial spaces (Moyle 2002). Spawning is generally associated with water temperatures from 46 to 57ºF. In the Central Valley, spawning occurs in the Sacramento River upstream of Hamilton City, perhaps as far upstream as Keswick Dam (Adams et al. 2002), and possibly in the lower Feather River (Moyle 2002).

Green sturgeon eggs hatch in approximately 8 days at 55ºF (Moyle 2002). Larvae begin feeding 10 days after hatching. Metamorphosis to the juvenile stage is complete within 45 days of hatching. Juveniles spend 1 to 4 years in fresh and estuarine waters (such as the delta) and migrate to salt water at lengths of 12 to 30 inches (NMFS 2005c).

Little is known about movements, habitat use, and feeding habits of green sturgeon. Green sturgeon have been salvaged at state and federal fish collection facilities in every month, indicating that they are present in the delta year-round. Juveniles and adults are reported to feed on benthic invertebrates, including shrimp and amphipods, and small fish (NMFS 2005c).

Green sturgeon may occur at the erosion sites, either as adults migrating upstream to their spawning habitat, or as juveniles, rearing and migrating towards the ocean. Adult sturgeon tend to utilize deep channel habitat for spawning, and juveniles are likely to utilize bank habitat as it provides increased protection, shade, and food.

Sacramento splittail

The Sacramento splittail was listed as threatened by the USFWS on February 8, 1999. On September 22, 2000, the Federal Eastern District Court of California remanded the determination. After review, the USFWS removed the Sacramento splittail from the list of threatened species in 2003.

The species is now listed by the Sacramento office as a species of concern. It was formerly known to occur in rivers throughout the Central Valley and Sacramento-San Joaquin Delta, and is now largely restricted to the delta, Suisun Bay, Suisun Marsh, and Napa Marsh.

Adult Sacramento splittail move upstream from late November to late January, foraging in flooded areas along the main rivers, bypasses, and tidal freshwater marsh areas of Montezuma and Suisun sloughs and in San Pablo Bay prior to the onset of spawning. Feeding in flooded riparian areas prior to spawning may contribute to spawning success and survival of adults after spawning (Moyle et al. 2001). Sacramento splittail migration appears closely tied to river outflow. In wet years with increased river flow, adult Sacramento splittail will move long distances upstream to spawn, allowing juvenile rearing in upstream habitats. The upstream migration is smaller during dry years, although larvae and juveniles are often found upstream of Sacramento to Colusa or Ord Bend on the Sacramento River (Moyle et al. 2001). Sacramento splittail are thought to be fractional spawners, with individuals spawning over a protracted period, often for as long as several months (Wang 1991). Spawning typically occurs on inundated floodplains from February through June, with peak spawning in March and April. The adhesive eggs are released by the female, fertilized by one or more attendant males, and adhere to vegetation until hatching (Moyle 2002).

After emergence, most larval Sacramento splittail remain in flooded riparian areas for 10 to 14 days, most likely feeding among submerged vegetation before moving off floodplains into deeper water as they become stronger swimmers (Sommer et al. 1997, Wang 1986, both as cited in Moyle 2002). Although juvenile Sacramento splittail are known to rear in upstream areas for a year or more (Baxter 1999, as cited in Moyle et al. 2001), most move to tidal waters after only a few weeks, often in response to flow pulses (Moyle et al. 2001). The majority of juveniles apparently move downstream into shallow, productive bay and estuarine waters from April to August (Meng and Moyle 1995).

Adult and juvenile Sacramento splittail may occur at the erosion sites. The species' original range included the Sacramento River as far upstream as Redding, the Feather River upstream to Oroville, and the American River upstream to Folsom. Most Sacramento splittail are currently found in the delta and Suisun Marsh (Moyle 2002). In wet years, however, they have been known to ascend the Sacramento River as far upstream as Red Bluff Diversion Dam and into the lower Feather and American rivers (Baxter 2000, Baxter 1999, Sommer et al. 1997, all as cited in Moyle 2002). Currently the Sutter and Yolo bypasses along the lower Sacramento River appear to be important Sacramento splittail spawning areas (Sommer et al. 1997).

4.6.1.2 Special Status Wildlife Species

Many of the erosion sites are highly disturbed, and therefore not the preferred habitat of most raptor species. Erosion sites located around the Sacramento metropolitan area are currently

used by local residents who walk, jog, fish, and bring their dogs and horses onto the levee for recreational purposes. Both feral and domestic cats may also pose a problem for any type of successful nesting activities that may occur. Therefore, it is likely that raptors would avoid areas.

Valley Elderberry Longhorn Beetle

The ESA lists the VELB as threatened (USFWS 1980). Although a recent review of the beetle's status recommends the species for delisting (Talley et al 2006), such action has not yet been finalized. The USFWS has designated critical habitat for this species along the American River Parkway and an area within the Sacramento metropolitan area. No erosion sites fall within these two areas.

A California endemic species, VELB are found in scattered populations throughout their range, which includes most of California's Central Valley (Barr 1991). The adults feed exclusively on *Sambucus* spp. foliage and are active from early March through early June. The beetles mate in May and females lay eggs on living elderberry shrubs. Larvae bore through the stems of the shrubs to create an opening in the stem within which they pupate. After metamorphosis is complete, the adult beetle chews a circular exit hole through which it emerges (Barr 1991).

Elderberry shrub surveys were performed by Parus Consulting biologists for the 13 erosion sites in January and February 2008. These surveys were conducted in accordance with USFWS valley elderberry longhorn beetle conservation guidelines (USFWS 1999). Elderberry shrubs occur at the following erosion sites: Sac 53.5R, Sac 77.2L, LAR 0.3L, and F 28.5R.

All shrubs having stems greater than 1 inch in diameter at ground level (DGL) provide potentially suitable habitat for VELB. During construction activities, 9 elderberry shrubs with 137 stems 1 inch or greater in diameter could be affected by levee restoration activities at sites F 28.5R, LAR 0.3L, Sac 53.5R and Sac 77.2L. Six elderberry shrubs with 96 stems 1 inch or greater in diameter occur within the construction footprint while three shrubs with 41 stems 1 inch or greater in diameter are located within the construction easement. There are an additional 10 shrubs with 20 elderberry stems 1 inch or greater in diameter located outside of the erosion site and the construction easement. The locations and attributes of these specimens were recorded in the field and mapped using GPS technology. Appendix H is a summary of these findings.

Northwestern Pond Turtle

The northwestern pond turtle (NPT) is a California Species of Special Concern (Jennings and Hayes 1994). The NPT's distribution ranges from Puget Sound in Washington state south to about the Sacramento-San Joaquin Delta, extending from the coast inland to the Sierra Nevada-Cascade Ranges up to about 4,600 feet in elevation (CDFG 2005).

The NPT is an aquatic species, only leaving the water to overwinter, aestivate, disperse if water disappears, or lay eggs. NPTs prefer still or slow-moving water (CDFG 2005). They frequently bask on surfaces that project out of the water, such as fallen logs, but rarely climb more than a few inches above the water surface. Suitable basking sites and nearby upland habitat (typically grassy slopes with sandy soils) for egg laying are essential components for this species.

NPTs were not observed within any of the erosion sites during the January and February 2008 field surveys. Due to cold winter weather, observation of live turtles was not expected.

Cooper's Hawk

The migratory Cooper's hawk is protected under the federal MBTA (USFWS 2008) and is listed as a federal species of concern. Suitable nesting and foraging habitat for Cooper's hawk occurs along the Sacramento River system. Cooper's hawks were observed at site Sac 52.3R during field surveys conducted in January and February 2008.

Great Egret

The great egret is protected under the MBTA (USFWS 2008). Great egret rookeries (breeding colonies) are designated by the CNDDB as secure throughout the state and worldwide range of the great egret; however, factors exist to cause concern, including narrowing habitat.

Great Egrets were observed in transit and/or foraging at erosion sites CS 21.8R, Sac 49.7L, Sac 52.3L, Sac 53.5R, Sac 177.8R, LAR 2.8L, and F 28.5R; however, no rookeries were observed. The remaining sites likely provide suitable foraging habitat for this species.

Great Blue Heron

The great blue heron is protected under the MBTA (USFWS 2008). Great blue heron rookeries are designated by the CNDDB as secure throughout the state and worldwide range of the great blue heron.

Great Blue herons were observed in transit and/or foraging at erosion sites Sac 42.7R and Sac 177.8R; however, no rookery sites were observed. All of the remaining sites likely provide suitable foraging habitat for this species.

Swainson's Hawk

The Swainson's hawk is a migratory bird protected under the MBTA (USFWS 2008). In California, it is a listed threatened species under CESA. Potentially suitable nesting habitat exists within several of the erosion sites, and there are CNDDB occurrences recorded within a 5 mile radius of all of the erosion sites.

No Swainson's hawk nests are known to occur on any of the erosion sites, however the following sites have recorded occurrences of Swainson's hawks within ½ mile: SB 16.6R, Sac 16.8L, Sac 42.7L, Sac 52.3L, and Sac 55.2L. While Swainson's Hawk were observed within close proximity to the erosion sites during spring 2008 surveys, no evidence of active nesting was observed.

Western Yellow-billed Cuckoo

The western yellow-billed cuckoo is protected under the MBTA (USFWS 2008), and is state listed as endangered. A population census estimate conducted in 1999 showed that only 50 western yellow-billed cuckoo pairs exist in California (Hughes 1999). There numbers have declined drastically in the past few decades primarily due to the destruction of riparian habitat (Laymon and Halterman 1987).

There are several recorded occurrences for this species near Sac 177.8R, the most recent, occurrence #14, is from 1993. Although there are recorded occurrences for this species within 5 miles of Sac 42.7R and F 28.5R, they are over 20 years old. Sac 49.7L is 3.5 miles

north of the nearest recorded occurrence. The absence of extensive willow-dominated riparian habitat at the erosion sites indicates that they do not likely provide suitable nesting habitat for this species.

Snowy Egret

The snowy egret is protected under the MBTA (USFWS 2008). Snowy egret rookeries are designated by the CNDDB as secure throughout the state and worldwide range of the species. A snowy egret was observed in transit at erosion site Sac 53.5R; however, no rookeries were observed on any of the project sites.

White-tailed Kite

The white-tailed kite is protected under the MBTA (USFWS 2008), and is fully protected in the state of California by the CDFG. A single white-tailed kite was observed foraging over an agricultural field near site CS 21.8R. Other erosion sites may be in close proximity to suitable foraging and nesting habitat for this species.

Black-crowned Night Heron

The black-crowned night heron is protected under the MBTA (USFWS 2008). Black-crowned night heron rookeries are designated by CNDDB as restricted throughout the statewide range of the species.

The black-crowned night heron was not observed during field surveys conducted in January and February 2008. The black-crowned night heron has a strong preference for habitats with dense foliage of trees, shrubbery, or vines (Ziener 1990). Potentially suitable foraging habitat occurs at erosion sites Sac 16.8L, Sac 53.5R, Sac 77.2L, and LAR 2.8L.

Osprey

The osprey is protected under the MBTA (USFWS 2008), and is state listed as a species of special concern. An osprey was observed in transit over the Sacramento River near site Sac 16.8L during a field survey conducted in February 2008; however there is no evidence of suitable, large nesting structures within any of the erosion sites.

Double-crested Cormorant

The double crested cormorant is protected under the MBTA (USFWS 2008), and is state listed as a species of special concern. This species was observed at 6 sites during field surveys conducted in January and February 2008; CS 21.8R, Sac 53.5R, Sac 55.2L, Sac 77.2L, Sac 177.8R, and F 28.5R.

Bank Swallow

Bank swallows are neotropical migrants that nest in colonies in alluvial soil along rivers, steams, lakes, and ocean coasts. There are approximately 100 known, widely distributed colonies in California. Bank swallows were listed as threatened by the state of California in 1989. In the Sacramento and Feather Rivers, their erosion prone habitat is threatened by flood control and bank protection projects (Garrison 1998).

Bank swallows are known to occur near Sac 177.8R, however, they have not been documented to use the site since CDFG annual surveys began in 1986, likely because it had already been rocked. Five colonies were documented using the east bank of the Sacramento River in this area, the most recent in 2003, approximately 0.5 miles southwest. The nearest

was approximately 800 feet southwest and across the river in 1998.

Swallow surveys were conducted in March and April of 2008 by qualified wildlife biologists. No bank swallows, or use of erosion sites by bank swallows were observed. Due to the bank profiles and sediment disposition, bank swallow are not expected to utilize any of the erosion sites.

Western Red Bat

The western red bat is listed as a California Species of Special Concern in the draft updated Mammalian Species of Special Concern Report (CDFG 2007). Its status according to the CNDDB is globally secure but vulnerable to extirpation in the state. Although rigorous documentation is lacking, experts believe a central factor behind the bat's apparent decline is the large-scale loss of lowland riparian forests that serve as the bat's primary habitat.

There are three CNDDB occurrences recorded for this species 2 miles southwest of Sac 16.8L, and 3.3 miles south of SB 16.6R. No bats were observed during site surveys conducted in January and February 2008, but this was expected due to the cold rainy weather and the bats' nocturnal behavior.

Hoary Bat

The hoary bat is listed as a California Species of Special Concern by the CNDDB. CNDDB occurrences were found within 5 miles of erosion repair sites. As expected, no observations of the hoary bat were made during January and February 2008 site surveys, due to winter weather and the species' nocturnal behavior.

4.6.1.3 Special Status Plant Species

Listed plant species are those taxa that are formally listed by the federal government pursuant to the ESA, or as endangered, threatened, or rare by the state of California pursuant to CESA or the Native Plant Protection Act (NPPA). Species listed as rare by professional organizations, such as CNPS, are also considered special status species.

Northern California Black Walnut

Northern California black walnut is classified by the CNPS as a list 1B.1 species. Although its native habitat is typically not within the erosion site areas (i.e., it is typically found in canyons and valleys 164 to 656 feet in elevation), the species has been widely planted, hybridizes readily with English walnut, and has been naturalized from cultivation in many areas.

This species is threatened by continued hybridization with orchard trees, urbanization, and conversion to agriculture. DNA analysis research is underway to define the origins of *Juglans* now encroaching into cottonwood and valley oak riparian forests in the Sacramento Valley (Barbour et al. 2007). A stretch of the Sacramento River (occurrence #3) recognized by CDFG as an occurrence of this species encompasses Sac 16.8L and Sac 42.7R, and is within 5 miles of Sac 49.7L, Sac 52.3L, and SB 16.6R.

Delta Tule Pea

Delta tule pea is a CNPS list 1B.2 species. Delta tule pea is threatened by agriculture, water diversions, and bank erosion (CNPS 2008). There are recorded CNDDB occurrences for the delta tule pea within 5 miles of Sac 16.8L and SB 16.6R, which provide suitable habitat for

this species.

Mason's Lilaeopsis

Mason's lilaeopsis is a state rare plant and a CNPS list 1B.1 species. There are recorded CNDDB occurrences for Mason's lilaeopsis within 5 miles of SB 16.6R, CS 21.8R, and Sac 16.8L. The other erosion sites do not likely provide suitable habitat for this species. Threats to this species include bank erosion, channel stabilization, developing flood control projects, recreation, agriculture, shading resulting from marsh succession, and competition with non-native plants.

Delta Mudwort

Delta mudwort is a CNPS list 2.1 species. Threats to delta mudwort include habitat destruction, wave erosion, wave attenuation, and water quality degradation (CNPS 2008). There are recorded CNDDB occurrences for delta mudwort within 5 miles of SB 16.6R, CS 21.8R, and Sac 16.8L. The other erosion sites do not likely provide suitable habitat for this species.

Sanford's Arrowhead

Sanford's arrowhead is a CNPS List 1B species. It is threatened by grazing, development, and channel alteration. There are a number of recorded CNDDB occurrences near erosion sites, including SB 16.6R, CS 21.8R, LAR 0.3L and LAR 2.8L. However, bankline erosion from watercraft and high flow events during peak spring flows likely preclude the establishment of this species at these erosion sites.

Marsh Skullcap

Marsh skullcap is a CNPS List 2.2 species. The lower slopes of some erosion sites may provide potentially suitable habitat for this species. There is a recorded CNDDB occurrence for this species within 5 miles of Sac 16.8L.

Suisun Marsh Aster

Suisun Marsh aster is a CNPS list 1B.2 species. Threats to this plant include marsh habitat alteration and loss by bank erosion (CNPS 2008). There are a number of CNDDB occurrences for this species within 5 miles of SB 16.6R, CS 21.8R, and Sac 16.8L, and the aster was observed at these erosion sites during field surveys conducted in January and February 2008.

4.6.2 Regulatory Setting

4.6.2.1 Federal and State Laws and Regulations

California Endangered Species Act

CESA was enacted in 1984. Under the CESA, the California Fish and Game Commission has the responsibility for maintaining a list of threatened and endangered species. The CDFG also maintains lists of species of special concern, impacts to which would be considered significant under CEQA Guidelines Section 15380 and could require mitigation. Pursuant to the requirements of CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any state-listed endangered or threatened species may be present, and determine whether the proposed project would have a potentially significant

impact on such species. In addition, CDFG encourages informal consultation on any proposed project which may impact a candidate species. CESA prohibits the take of California listed animals and plants in most cases, but CDFG may issue incidental take permits under special conditions.

CEQA Guidelines

Although threatened and endangered species are protected by specific federal and state statutes, CEQA Guidelines section 15380(b) provides that a species not listed on the federal or state list of protected species may be considered rare or endangered if the species can be shown to meet certain criteria. These criteria have been modeled after the definition in the ESA and the section of the California Fish and Game Code dealing with rare or endangered plants and animals, and allows a public agency to undertake a review to determine if a significant effect on species that have not yet been listed by either the USFWS or CDFG (i.e., species of concern) would occur. Whether a species is rare, threatened, or endangered can be legally significant because, under CEQA Guidelines Section 15065, an agency must find an impact to be significant if a project would "substantially reduce the number or restrict the range of an endangered, rare, or threatened species." Thus, CEQA provides an agency with the ability to protect a species from a project's potential impacts until the respective government agencies have an opportunity to designate the species as protected, if warranted.

California Native Plant Society

CNPS is a professional organization that maintains an inventory of special-status plant species. CNPS maintains 4 species lists of varying rarity. Vascular plants listed as rare or endangered by the CNPS, but which have no designated status or protection under federal or state-endangered species legislation, are defined as follows:

- List 1A Plants Believed Extinct
- List 1B Plants Rare, Threatened, or Endangered in California and elsewhere
- List 2 Plants Rare, Threatened, or Endangered in California, but more numerous elsewhere
- List 3 Plants about which More Information is Needed - A Review List
- List 4 Plants of Limited Distribution - A Watch List

In general, plants appearing on CNPS List 1 or 2 are considered to meet CEQA Guidelines section 15380 criteria and project effects to these species may be considered significant.

Federal Endangered Species Act

Under the ESA, the Secretary of the Interior and the Secretary of Commerce, have joint authority to list a species as threatened or endangered (16 USC 1533[c]). The ESA is administered by both the NMFS and the USFWS. NMFS is accountable for animals that spend most of their lives in marine waters, including marine fish, most marine mammals, and anadromous fish such as Pacific salmon. The USFWS is accountable for all other federally-listed plants and animals.

Pursuant to the requirements of the ESA, an agency reviewing a proposed project within its jurisdiction must determine whether any federally listed threatened or endangered species may be present and determine whether the proposed project will have a potentially

significant impact on such species. In addition, the agency is required to determine whether the project is likely to jeopardize the continued existence of any species proposed to be listed under the ESA, or result in the destruction or adverse modification of critical habitat proposed to be designated for such species (16 USC 1536[3], [4]).

The Sacramento Fish and Wildlife Office maintains a list of "species of concern" that receive special attention from federal agencies during environmental review, although they are not otherwise protected under the ESA. Project-related impacts to such species would also be considered significant under CEQA Guidelines (Section 15380) and would require mitigation.

Projects that would result in *take*[1] of any federally-listed threatened or endangered species are required to obtain authorization from NMFS and/or USFWS through either section 7 (interagency consultation) or section 10(a) (incidental take permit) of ESA, depending on whether the federal government is involved in permitting or funding the project. The section 7 authorization process is used to determine if a project with a federal nexus would jeopardize the continued existence of a listed species and what mitigation measures would be required to avoid jeopardizing the species. The section 10(a) process allows take of endangered species or their habitat in non-federal activities.

Fish and Game Code

Birds of prey are protected in California under the California Fish and Game Code section 3503.5, which states that it is unlawful to take, possess, or destroy any birds in the order Falconiformes or Strigiformes (birds of prey) or to take, possess, or destroy the nest or eggs of any such bird, except as otherwise provided by this code or any regulation adopted pursuant thereto. Construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings, or otherwise lead to nest abandonment. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered take by the CDFG. Any loss of fertile eggs, nesting raptors, or any activities resulting in nest abandonment would constitute a significant impact.

Migratory Bird Treaty Act

The MBTA is enforced by the USFWS (16 USC Section 703-711). The original 1918 statute implemented the 1916 Convention between the United States and Great Britain (for Canada) for the protection of migratory birds. Later amendments implemented treaties between the United States and Mexico, Japan, and the Soviet Union (now Russia).

Specifically, the act includes the establishment of a federal prohibition to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird... or any part, nest, or egg of any such bird" unless such acts are permitted by regulations. The federal definition of take includes activities that involve harassment, harm, pursuit, hunting, shooting, wounding, killing, trapping, capturing, or collecting, or to attempt

[1] "Take" under the federal definition means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

to engage in any such conduct. Birds covered by this act include waterfowl, shorebirds, raptors, songbirds and many other species.

4.6.2.2 Local Laws and Regulations

City of Sacramento General Plan

The General Plan requires that project proponents make every effort to minimize take of sensitive natural resources, and development must avoid alteration of areas containing sensitive natural resources.

City of West Sacramento General Plan

Section VI, Goal C of the General Plan is "to protect sensitive native vegetation and wildlife communities and habitat." Specific policies relating to this goal seek to preserve populations of rare, threatened, and endangered species by ensuring that development does not adversely affect such species or by fully mitigating those effects. Projects that would cause unmitigatible impacts to special status wildlife will not be approved by the city.

Glenn County General Plan

The Glenn County General Plan, policy NRP-49, encourages joint planning with state and federal agencies and private citizens to protect special status species.

Sutter County General Plan

Policy 4.C-7 states that the county encourages the preservation of rare, threatened or endangered animal species. Threatened, rare, and endangered plants are protected by general plan policy 4.D-2.

4.6.3 Environmental Effects

Effects on special-status species would be considered significant if construction or operation of the project would:

- Adversely affect critical habitat;
- Result in an unmitigated take of a special-status species; or
- Adversely affect a special-status species.

4.6.3.1 Alternative 1: Proposed Action

Under this alternative, a berm would be constructed of rip-rap at the base of the levee, with the remainder of the levee slope that is subject to erosion covered in a mixture of soil and riprap. The erosion repairs have been designed to maximize the habitat values on the sites, providing for emergent, riparian, and upland habitats in ratios appropriate for each site locale. Adverse impacts to special status species and their habitat would be primarily short term (during construction).

Cover losses will occur concurrently with the construction, and will specifically affect the SRA available to aquatic organisms. Of the 11.6 acres of terrestrial habitat within the combined project footprints, there will be temporary effects on 4.6 acres of riparian vegetation, including 3.8 acres of riparian forest and 0.8 acre of riparian scrub. Based on review of the project designs and on-site surveys, it is assumed that 25% of the existing trees may be permanently affected by the placement of rock around the root crown and limb

pruning or removal, both during initial construction activities and during operation and maintenance activities. The impact of these temporary habitat losses would be mitigated through incorporation of plantings and IWM in the erosion repair design.

Activities of the Proposed Action alternative would affect the following special-status species: special-status wildlife and plants that may be observed during the recommended pre-construction surveys, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley fall-/late fall-run Chinook salmon, Central Valley steelhead, delta smelt, longfin smelt, green sturgeon, and Sacramento splittail. Project effects also include alteration of Essential Fish Habitat (EFH) for Chinook salmon (all ESUs), and the designated critical habitat of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and delta smelt.

Salmonids

Effects of the proposed project on special status salmonids include both short- and long-term impacts. Short-term effects, which are qualitatively evaluated, include direct impacts from construction activities (e.g., increased suspended sediment and turbidity), lasting from a few hours to several weeks. Short-term effects consider the potential occurrence of listed species and life stages relative to the location, magnitude, timing, frequency, and duration of project activities. In-water construction at the erosion sites would occur during fall and winter of 2008 and 2009, a time when salmonid juveniles and smolts may be rearing and outmigrating at the erosion sites, and when adult salmonids are likely to be moving upstream past the erosion sites.

Short-term construction-related effects

Construction activities are expected to result in short-term increases in turbidity and suspended sediment that could disrupt feeding activities of fish and result in temporary disturbance or displacement from preferred habitats at the erosion sites and downstream. High concentrations of suspended sediment can temporarily bury stream substrates that provide habitat for aquatic invertebrates, an important food source for juvenile salmonids. Noise from in-water construction activities and the presence of overhead equipment could also temporarily disrupt essential behavior patterns (e.g., feeding, escape from predators, migration) of adult and juvenile salmonids at the erosion sites, and may also be propagated upstream and downstream. The potential also exists for injury or mortality of juvenile salmonids and other fish species that may not be able to readily move away from nearshore areas directly affected by construction activities (i.e., during placement of rock).

Toxic substances used at construction sites, including gasoline, lubricants, and other petroleum-based products could enter the Sacramento River as a result of spills or leakage from machinery or storage containers. These substances can kill aquatic organisms through exposure to lethal concentrations or exposure to non-lethal levels that cause physiological stress and increased susceptibility to other sources of mortality. With implementation of the mitigation measures (i.e., appropriate BMPs, see Section 4.5.4 and Appendix J), exposure of aquatic species to toxic substances is not expected to occur as a result of project activities. However, mortality or physiological impairment of juvenile Chinook salmon and steelhead is possible if exposure to sufficient concentrations does occur.

Construction activities, which would occur in Fall 2008 and Fall 2009, may affect adult

salmon and steelhead because construction activities would occur during the primary upstream migration period for winter-run and spring-run Chinook salmon, and for a large portion of the migration window for late fall-run Chinook salmon and steelhead. Construction barges and heavy equipment would be present in the main channel through which adults are migrating to spawning areas upstream. The overhead movement of equipment and the sound generated by construction activities may affect the behavior of migrating adult salmonids, possibly causing migration delays or preventing access to spawning areas. Injury or mortality of adult salmonids is unlikely, since adults primarily use deep, mid-channel habitat during their upstream migration and placement of rock would be restricted to the channel edge. However, placement of toe-rock could possibly injure or kill adult salmonids. Spawning habitat for Chinook salmon or steelhead is not present at the erosion sites or downstream. Therefore, no short- or long-term effects on habitat for spawning or incubation would occur.

Short-term construction-related impacts to Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley fall-/late fall-run Chinook salmon, and Central Valley steelhead ESUs would be partially mitigated by implementing the proposed minimization and avoidance measures (Section 4.5.4). However, because these measures would not fully avoid or mitigate potentially significant short-term effects to individual fish, formal consultation under Section 7 of the ESA will be completed by June 8, 2008.

Long-term effects on habitat

Long-term impacts may last months or years and generally involve physical alteration of the bank and riparian vegetation adjacent to the water's edge, with consequent impacts upon SRA cover, as defined by USFWS (Fris and DeHaven 1993). Appendix I describes a quantitative assessment of long-term effects using the Standard Assessment Methodology (SAM) for the SRBPP (USACE 2004). The SAM assesses long-term impacts by comparing special-status salmonid species responses to long-term differences in habitat under with- and without-project conditions. In general, the effects are measured in terms of the area of bank and channel bed disturbed by construction, and the quantity and quality of aquatic, bank, floodplain, and supporting riparian habitat.

Long-term species habitat attributes potentially affected by construction activities include spawning habitat area and quality, rearing habitat area and quality, migration habitat conditions, and predator habitat suitability. Project effects on habitat for rearing and outmigrating salmon and steelhead include alteration of bank slope and river hydraulics, in-stream and overhead cover, and substrate conditions along the seasonal low- and high-flow shorelines at the erosion sites. Altered bank characteristics could also cause changes to hydraulics, cover, and substrate conditions immediately downstream of the erosion sites, potentially reducing habitat quantity and quality for rearing juveniles. Long-term changes in nearshore habitat are expected to have negligible effects on adult salmon and steelhead because adults generally use deep, mid-channel habitat during migration. Losses of riparian shade and IWM, however, may reduce habitat value for adult salmonids due to reduced cover available for resting and holding during upstream migration (Chinook salmon and steelhead) and adult residence (steelhead).

The cumulative SAM results for all 13 sites indicate that all salmonid life stages would

potentially exhibit positive habitat responses by WY 2009 (Year 1) in all seasons followed by long-term positive habitat gains through Year 50 (Appendix I). Short-term deficits occur as the result of the initial reduction in shade and IWM at all sites during project construction. Installation of excess anchored IWM at most sites and replacement IWM at sites downstream of RM 30 (See Appendix I) is sufficient to provide immediate habitat gains during higher water stages that typically occur during winter and spring. During summer, when IWM would not be inundated at some sites (e.g., LAR 0.3L and 2.8L), cumulative SAM results across all sites shows that recovery to pre-project conditions would not occur until WY 2011 (Year 3) followed by long-term habitat gains for all life stages.

Generally, the habitat deficits modeled by the SAM in Programmatic Region 1b (8 sites: Sac 42.7R, 49.7L, 52.3L, 53.5R, 55.2L, 77.2L and Lower American River 0.3L and 2.8L) and Region 3 (1 site: Sac RM 177.8R) are effectively off-set by the habitat gains within the adjacent Region 1a (3 sites: SB 16.6R, Sac 16.8L, and CS 21.8R) and Region 2 (site Feather River RM 28.5R). Both Regions 1a and 2 will exclusively contain sites with planted wetland benches that offer year-round habitat benefits to the affected life stages at sites within the adjacent regions. The constructed wetland benches are expected to increase the availability of valuable shallow-water rearing habitat with hiding cover for juvenile salmonids, resulting in net increases in habitat for juveniles and smolts at these sites. The density of planted wetland vegetation would also minimize the wetland bench area available to large predators such as largemouth bass, and predation rates in the constructed wetland habitat would therefore not be expected to exceed predation rates that normally occur in other seasonally flooded off-channel habitats where salmon and steelhead may rear.

In summary, the project is expected to provide long-term increases in the quantity and quality of critical habitat for Sacramento River winter-run Chinook salmon, and Central Valley spring-run Chinook salmon ESUs, as well as the Central Valley steelhead DPS, and long-term benefits to EFH for all Chinook salmon ESUs. In summer and fall when river stage is lowest, mitigation features included in the project design generally compensate for potentially significant long-term impacts on habitat at the majority of sites for all salmonid life stages. The one potential exception to these findings is that low-level habitat deficits in summer and fall for salmonid juveniles and smolts may were identified at the Sac 177.8R site (Appendix I). Although these habitat deficits are low, prior NMFS (2001) guidance suggests that a suitable mitigation site within 50 miles should be identified and developed to fully compensate for habitat losses at Sac 177.8R. General mitigation and avoidance measures and species-specific mitigation measures are further described in Section 4.5.4. Details of proposed off-site mitigation are described in Section 2.10. Cumulative effects on Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and Central Valley steelhead ESUs are further discussed in Section 5.1.6.

Delta Smelt

Effects of the proposed project on delta smelt include both short- and long-term impacts of sites within Programmatic Region 1a (3 sites: SB 16.6R, Sac 16.8L, and CS 21.8R) and Region 1b (8 sites: Sac 42.7R, 49.7L, 52.3L, 53.5R, 55.2L, 77.2L and Lower American River 0.3L and 2.8L) corresponding to the delta smelt critical habitat. Short-term effects, which are evaluated qualitatively, include direct impacts from construction activities (e.g., increased suspended sediment and turbidity), lasting from a few hours to several weeks. Long-term

impacts may last months or years and generally involve physical alteration of the bank and riparian vegetation adjacent to the water's edge, with consequent impacts upon SRA cover as defined by USFWS (Fris and DeHaven 1993).

Short-term construction-related effects

Short-term adverse effects on delta smelt may be caused by construction activities that increase noise, turbidity, suspended sediment, and potential release of toxic substances. Sediment and turbidity effects may occur at the erosion sites and downstream. Noise effects may occur at the erosion sites, as well as upstream and downstream. The potential also exists for injury or mortality of delta smelt that may not be able to readily move away from channel or nearshore areas directly affected by construction activities (i.e., placement of rock revetment). In addition, mortality or physiological impairment may be caused by toxic substances (i.e., gasoline, lubricants, oil) entering the water.

Short-term construction-related effects would be partially minimized or mitigated by implementing the proposed minimization and avoidance measures (Section 4.5.4). With implementation of these measures, and due to the short-term nature of the effects, effects on critical habitat are expected to be less than significant. However, because these measures would not fully avoid or mitigate potentially significant short-term effects to individual fish, formal consultation under Section 7 of the ESA will be completed by June 8, 2008.

Long-term effects on habitat

Appendix I describes a quantitative assessment of long-term effects on delta smalt life stages using the SAM (USACE 2004). Cumulative delta smelt habitat responses during winter and spring, as modeled by the SAM, exhibit positive values by WY 2009 (Year 1) followed by continued gains through Year 50. Similar to the salmonid responses, the inundation of the planted wetland and riparian benches (3 sites: SB 16.6R, Sac 16.8L, CS 21.8R, and Sac 52.3L) during winter and spring offer sufficient improvements to habitat quality under with-project conditions, including increased shallow water habitat (i.e., less steep bank slope), finer bank substrate size, and increased bank-line cover of IWM, aquatic vegetation, and overhead shade.

In summer, however, long-term delta smelt habitat deficits would potentially occur due to the initial reduction in IWM cover, but would be off-set by the eventual habitat benefits stemming from the wetland bench sites. The recovery of these initial habitat deficits would occur by WY 2013 (Year 5), followed by continued habitat gains through Year 50. However, because this recovery period is longer than the 2-year recovery period adopted during the development of the SAM (USACE 2004), the proposed project would adversely affect summer spawning and incubation and juvenile rearing habitat for delta smelt and additional off-site compensation is required.

In summary, potential long-term adverse impacts on delta smelt and their critical habitat are expected to occur only under summer flow conditions on the Sacramento River. Although impacts to potential habitat use at upstream sites within Region 1b by delta smelt are not expected due to the typical restricted downstream distribution of delta smelt (Bennett 2005, Moyle 2002), SAM results indicate that off-site mitigation would be required to offset potentially significant long-term impacts on spawning and incubation and juvenile rearing habitat. Because delta smelt are restricted to waters with suitable salinity, prior USFWS

(2001) recommendations indicate that potential mitigation sites should be located within the lower reaches of the SRBPP (RM 0 to 80). General mitigation and avoidance measures are described in Section 4.6.4. Details of proposed off-site mitigation are described in Section 2.10. Cumulative effects on delta smelt due to the proposed project are further discussed in Section 5.1.6.

Longfin smelt

Effects of the proposed project on longfin smelt include both short- and long-term impacts. Short-term and long-term effects are evaluated qualitatively. Short-term effects include direct impacts from construction activities (e.g., increased suspended sediment and turbidity), lasting from a few hours to several weeks. Long-term impacts may last months or years and generally involve physical alteration of the bank and riparian vegetation adjacent to the water's edge, with consequent impacts upon SRA cover as defined by USFWS (Fris and DeHaven 1993).

Short-term construction-related effects

Short-term adverse effects on longfin smelt may be caused by construction activities that increase noise, turbidity, suspended sediment, and potential release of toxic substances. Sediment and turbidity effects may occur at the erosion sites and downstream. Noise effects may occur at the erosion sites, as well as upstream and downstream. The potential also exists for injury or mortality of longfin smelt that may not be able to readily move away from channel or nearshore areas directly affected by construction activities (i.e., placement of rock revetment). In addition, mortality or physiological impairment may be caused by toxic substances (i.e., gasoline, lubricants, oil) entering the water.

Short-term construction-related effects would be partially minimized or mitigated by implementing the proposed minimization and avoidance measures (Section 4.5.4). With implementation of these measures, and due to the short-term nature of the effects, effects on critical habitat are expected to be less than significant. However, because these measures would not fully avoid or mitigate potentially significant short-term effects to individual fish, formal consultation under Section 7 of the ESA will be completed by June 8, 2008.

Long-term effects on habitat

Long-term effects of the project on longfin smelt were not modeled, but they have similar life history requirements as delta smelt, so general statements about long-term effects can be made based on delta smelt modeling. Long-term project effects on longfin smelt in Steamboat Slough at site 16.6R, Cache Slough at site 21.8R, Sacramento River at 52.3L, and Sacramento River at site 16.8L are expected to be similar because wetland benches, planted with emergent aquatic vegetation, are expected to rapidly provide suitable spawning and rearing habitat for longfin smelt at these sites. Proposed planting of emergent vegetation at these sites would enhance habitat complexity by providing cover, incubation habitat, and possibly spawning habitat, especially during high winter and spring flows. Project effects at these sites would be beneficial to all longfin smelt life stages.

Adult and juvenile longfin smelt reside mainly in the tidally influenced areas of the river, whereas freshwater habitat is utilized primarily for spawning. The locations of primary spawning areas for longfin smelt are not well-known. For this analysis, it is assumed that spawning habitat for longfin smelt is generally similar to that of delta smelt. Therefore,

potential long term impacts that would be expected for delta smelt and their habitat would also correspond to those for longfin smelt under summer flow conditions at seven of the sites within Region 1b (8 sites: Sac 42.7R, 49.7L, 53.5R, 55.2L, 77.2L and Lower American River 0.3L and 2.8L). Although impacts to potential habitat use at upstream sites within Region 1b by longfin smelt are not expected, general mitigation and avoidance measures are described in Section 4.5.4 for delta smelt should benefit longfin smelt as well. Cumulative effects on longfin smelt due to the proposed project are further discussed in Section 5.1.6.

Green sturgeon

Adult green sturgeon may move upstream through the erosion sites from February through late July. The Sacramento River downstream of Knights Landing (RM 90) is not believed to have suitable spawning habitat for green sturgeon. Therefore, the proposed construction at sites below RM 90 will not affect spawning habitat. Larval and juvenile green sturgeon move downstream in the Sacramento River from February through late July (peak spawning occurs from April through June) (Emmett et al. 1991, as cited in Moyle 2002) and may therefore occur at all erosion sites during a portion of the Phase 1 work. Construction activities occurring outside these time periods are not likely to affect migrating green sturgeon adults. Construction activities from February through May, however, may have adverse impacts on all green sturgeon life stages.

Construction activities, which would occur in winter and spring, may affect adult, larval, and juvenile green sturgeon because construction activities would occur during the primary upstream migration period for adults, and during the downstream migration period for larvae and juveniles. Construction barges and heavy equipment would be present in the channel through which adults, larvae, and juveniles are migrating. The overhead movement of equipment and the sound generated by construction activities may affect the behavior of migrating adult green sturgeon, possibly causing migration delays or preventing access to spawning areas. Injury or mortality of adult green sturgeon is unlikely, since adults primarily use deep, mid-channel habitat during their upstream migration and placement of rock revetment would be restricted to the channel edge. However, placement of toe-rock could possibly injure or kill adult green sturgeon. Larval and juvenile green sturgeon may be especially susceptible to injury or death as a result of toe rock placement in shallow nearshore waters where they take refuge from predators in deeper mid-channel areas.

Short-term effects of in-water construction activities may include localized disturbance or displacement of adult, larval, and juvenile green sturgeon from noise, suspended sediment, turbidity, and sediment deposition. Sediment and turbidity effects may occur at the erosion sites and downstream. Noise effects may occur at the erosion sites, as well as upstream and downstream. Sediment deposition could adversely affect rearing habitat and kill or reduce production of food sources, such as aquatic invertebrates, for larval and juvenile green sturgeon. In addition, mortality or physiological impairment of larvae or juveniles may be caused by toxic substances (e.g., gasoline, lubricants, oil) entering the water. Because adult green sturgeon use the Sacramento River at the erosion sites primarily as a migration corridor, toxic effects on adults are unlikely. The potential also exists for injury or mortality of larvae or juveniles that may not be able to readily move away from channel or nearshore areas directly affected by construction activities (i.e., placement of rock). Injury or mortality of adult green sturgeon is unlikely, since adults primarily use deep, mid-channel habitat

during their upstream migration.

Short-term construction-related effects could result in significant impacts on green sturgeon. Construction-related impacts would be partially mitigated by implementing the proposed minimization and avoidance measures (Section 4.5.4). However, these measures would not fully avoid or mitigate potentially significant effects and take may therefore occur. Short-term effects of the project on green sturgeon are therefore considered to be potentially significant.

Long-term changes in nearshore habitat are expected to have negligible effects on adults because adult sturgeon use deep, mid-channel habitat during migration. However, if suitable deep habitat exists near eroding banks at the erosion sites (i.e., erosion scour holes) adverse effects on adult green sturgeon may occur if these areas are filled with rock. If juvenile sturgeon use nearshore areas of the Sacramento River as foraging habitat or refuge from predators, the general long-term effects of the project on nearshore habitat values would likely be similar to those described for salmonids above. Addition of IWM at sites upstream and inclusive of Sac 42.7L is expected to increase rearing and foraging habitat for larval and juvenile green sturgeon during winter and spring, thereby providing some long-term benefits for these life stages. Long-term reductions in summer habitat for larvae and juveniles, however, may occur at sites where increases in riparian shade are not sufficient to compensate for the loss of in-stream structure (i.e., Sac 49.7R, LAR 0.3L, LAR 2.8L, Sac 53.5, Sac 177.8R, Sac 42.7R, Sac 55.2L, and F 28.5R). Off-site mitigation, as described in Section 2.10, would be required to compensate for these habitat losses.

Although long-term adverse effects on green sturgeon are likely at some sites, the overall long-term effects of the project on green sturgeon are expected to be positive and less than significant.

Sacramento splittail

Adult Sacramento splittail would likely be present at the erosion sites during Phase 1 construction activities during their upstream migration, which begins in November and continues through January. Juveniles may rear in the vicinity of the erosion sites year-round, but would primarily occur at the erosion sites during Phase 2 in July and August as they migrate downstream toward the delta. Spawning typically takes place on inundated floodplains from February through June. Effects on spawning adult Sacramento splittail or Sacramento splittail eggs are not expected to occur because no floodplain habitat exists in the project area.

During Phase 1 construction activities, construction barges and heavy equipment would be present in the channel through which adult Sacramento splittail are migrating. The overhead movement of equipment and the sound generated by construction activities may affect the behavior of migrating adults, possibly causing migration delays or preventing access to spawning areas. Injury or mortality of adult Sacramento splittail is unlikely, since adults primarily use deep, mid-channel habitat during their upstream migration and placement of rock would be restricted to the channel edge. However, placement of toe-rock could possibly injure or kill adult Sacramento splittail.

Short-term effects may include localized disturbance or displacement of adult and juvenile Sacramento splittail from noise, suspended sediment, and turbidity generated during Phase 1

in-water construction activities. Sediment and turbidity effects may occur at the erosion sites and downstream. Noise effects may occur at the projects sites, as well as upstream and downstream. Removal of riparian vegetation and IWM from the streambank may result in the short-term loss of overhead and in-stream cover, reducing habitat quality and quantity for adult and juvenile Sacramento splittail. The potential also exists for injury or mortality of Sacramento splittail that may be unable to readily move away from channel or nearshore areas directly affected by construction activities (i.e., placement of rock revetment). In addition, mortality or physiological impairment may be caused by toxic substances (e.g., gasoline, lubricants, oil) entering the water.

Short-term construction-related effects could result in significant impacts to individual Sacramento splittail. Construction-related impacts would be partially mitigated by implementing the proposed minimization and avoidance measures (Section 4.5.4). However, these measures would not fully avoid or mitigate potentially significant effects. Short-term effects of the project on Sacramento splittail are therefore considered to be potentially significant.

The proposed project would not result in any long-term effects on Sacramento splittail spawning or incubation habitat. Long-term effects on rearing habitat would likely be similar to those described for salmonids above. Potential long-term effects on habitat for rearing Sacramento splittail at some sites may therefore be significant. However, with the creation of floodplain habitat as part of off-site mitigation measures that would be required for salmonids and delta smelt (see Section 2.10), effects would be mitigated to less than significant levels.

Raptors

Temporary displacement of local wildlife populations due to increased human presence is likely to occur during construction activities. Disturbance from construction activities that may affect Swainson's hawk and other raptors include increased noise levels from generators, staging areas, vehicles, and river barges. The no nests have been observed on the construction sites, and the sites are not considered suitable foraging habitat, therefore the impacts of the proposed project are less-than-significant.

Valley Elderberry Longhorn Beetle

Current plans for the proposed levee repairs will require the removal of only one elderberry shrub, E036, from erosion site F 28.5R. The loss of this, and any other protected VELB habitat shall be mitigated for pursuant to USFWS guidelines.

Vegetation

Suisun marsh aster has been observed within SB 16.6R, CS 21.8R, and Sac 16.8L, and would likely be impacted by construction activities associated with these erosion sites. Appropriately-timed floristic surveys following CDFG (2000) and CNPS (2001) published survey guidelines should be conducted in 2008 for the following species: Sanford's arrowhead, delta mudwort, Mason's lilaeopsis, delta tule pea, and marsh skullcap. As of April 15, 2008, none of the above species has been observed on the erosion sites. If surveys confirm the presence of any of these special status plant species on the construction sites, effects would be analyzed and mitigation measures designed.

Summary

Long-term effects of the project on the habitat of listed fish species include alteration of river hydraulics, in-stream and overhead cover, and substrate conditions along the seasonal low- and high-flow shorelines of the project sites. The cumulative SAM results for all 13 sites indicate that with the exception of the RM 177.8R site, all salmonid life stages would exhibit positive habitat responses by WY 2009 (Year 1) in all seasons followed by long-term positive habitat gains through Year 50 (Appendix I). For delta smelt, long-term habitat deficits would potentially occur due to the initial reduction in IWM cover, but would be off-set by the eventual installation of IWM in addition to the habitat benefits stemming from the wetland bench sites. The recovery of this initial deficit would occur by WY 2013 (Year 5) and would be followed by continued habitat gains through Year 50. General mitigation and avoidance measures are described in Section 4.6.4. Details of proposed off-site mitigation are described in Section 2.10.

4.6.3.2 Alternative 2: Thin Rock Armor

This alternative would place a thin layer of rock revetment on the existing slope of the levee. The resulting slope, would, in many cases, not support mitigation planting, necessitating off site mitigation. The construction window would be the same, or possibly shorter than, in Alternative 1. Since the rock layer would be thin, and the existing slope of the levee would be maintained, it is assumed that hydraulics would be impacted less than in the proposed alternative, although specific modeling would be required to confirm this supposition.

The potential adverse effects of Alternative 2 on special-status fish would be due to short-term construction-related activities including localized disturbance or displacement of adult and juvenile fish because of noise, suspended sediment, and turbidity generated during in-water construction activities. Sediment and turbidity effects may occur at the erosion sites and downstream. Noise effects may occur at the projects sites, and upstream and downstream.

Removal of riparian vegetation and IWM from the streambank may result in the short-term loss of overhead and in-stream cover, reducing habitat quality and quantity for adult and juvenile fish. The potential also exists for injury or mortality of fish that may be unable to readily move away from channel or nearshore areas directly affected by construction activities (i.e., placement of rock revetment). In addition, mortality or physiological impairment may be caused by toxic substances (e.g., gasoline, lubricants, oil) entering the water.

Longer-term adverse effects could include reduced near-shore habitat value for spawning and incubation by delta smelt, and for rearing and adult migration life stages of all special-status fishes. These effects would result from addition of rock revetment and removal or burial of riparian and emergent vegetation at emergency bank repair locations. Alternative 2 does not address slope stability issues and because bank slopes would not be reduced, mid-term (i.e. ~25 years) levee failures are possible. Levee failure could potentially transport fish out of the Sacramento River into areas where they are likely to become stranded, and could result in post-failure emergency repair measures in which BMPs and mitigation measures would be more difficult to implement. Limited BMPs and mitigation measures would have a greater potential to affect special-status wildlife and plants. These effects could result in significant

impacts to longfin smelt, salmon, steelhead and green sturgeon, and to critical habitat for delta smelt.

As in Alternative 1, some impacts to native cover would be unavoidable. All trees onsite would be preserved to the greatest extend possible. Other effects similar to those of Alternative 1 include those to Swainson's hawk, VELB and special status plants. This alternative would result in a loss of habitat and special status special species similar to Alternative 1, but would preclude onsite mitigation of such impacts.

4.6.3.3 Alternative 3: No Action

Under this alternative, no repair work would be conducted at the erosion repair sites. No immediate effects to special status species would occur. There is the potential that future levee failure could have a negative effect on the special status species habitat currently on the erosion sites, especially aquatic fish habitat.

The No Action alternative would likely result in levee failure that could potentially transport fish out of the Sacramento River into areas where they are likely to become stranded, as well as lead to post-failure emergency repair measures in which BMPs and mitigation measures would be more difficult to implement. Limited BMPs and mitigation measures would have a greater potential to affect special-status wildlife and plants. The No Action alternative's post-failure emergency repair measures would likely include alteration of EFH of Chinook salmon (all ESUs), and the designated critical habitat of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and delta smelt.

Short-term adverse effects of emergency levee repair could include increases in turbidity and suspended sediment that may disrupt feeding activities or result in temporary displacement of individuals from preferred habitats. High concentrations of suspended sediment can also bury stream substrates that provide habitat for aquatic invertebrates, an important food source for many fish species. In addition, toxic substances used at construction sites, including gasoline, lubricants, and other petroleum-based products could enter the Sacramento River as a result of spills or leakage from machinery or storage containers. These substances can kill aquatic organisms through exposure to lethal concentrations. Exposure to non-lethal levels can cause physiological stress and increased susceptibility to other sources of mortality. Although unlikely, direct mortality of individuals could also occur as a result of in-water construction activities such as placement of rock revetment.

Longer-term adverse effects of emergency repairs could include reduced near-shore habitat value for spawning and incubation by delta smelt, and for rearing and adult migration life stages of all special-status fishes. These effects would result from addition of rock revetment and removal or burial of riparian and emergent vegetation at emergency bank repair locations.

Because BMPs and mitigation measures may not be implemented for emergency bank repair actions that could occur under the No Action alternative, it would not be possible to avoid the short-term and long-term effects described above. These effects could result in significant impacts to delta smelt, salmon, steelhead and green sturgeon, and to critical habitat for delta smelt.

4.6.4 Mitigation

Mitigation for project effects on special-status species will include both on- and off-site mitigation for the 13 erosion sites. The mitigation program will be revised and finalized as the project impacts are updated with additional detail and suitable mitigation lands are identified and acquired. However, the types of impacts are not expected to change and the extent of impacts is expected to be reduced through avoidance and minimization strategies to be exercised during the final design process. Therefore, the mitigation measures described below, together with the mitigation incorporated in the project descriptions, are adequate to avoid significant effects under both NEPA and CEQA.

During construction operations, stockpiling of construction materials, portable equipment, vehicles, and supplies will be restricted to the designated construction staging areas outside of any environmentally sensitive areas. The applicant will ensure contamination of terrestrial and aquatic habitats do not occur during such operations. All workers will be informed of the importance of preventing spills and appropriate measures to take should a spill occur. A qualified biologist will provide Worker Environmental Awareness Program (WEAP) training to contractors and construction crews regarding all special status species known to occur on the erosion sites, including the status of the elderberry beetle, its relationship with its host plant, the need to avoid damaging elderberry shrubs, and the possible penalties for not complying with these requirements.

Valley Elderberry Longhorn Beetle

To avoid potential effects to VELB habitat, the USACE and its contractors shall use Elderberry GPS location maps to determine vehicle and equipment haul routes and work areas. Orange *Environmentally Sensitive Area* fencing will be installed around each elderberry shrub and shrub cluster as identified from mapping efforts.

One elderberry shrub has been identified for removal (E036). This shrub will be transplanted to a mitigation bank approved by the USFWS. As required by the standard USWFS service mitigation ratios (Table 4-7), this will result in the planting of 51 elderberry seedlings. In addition, two elderberry shrubs located on LAR 0.3L E009 and E010) are presumed to require removal. The total mitigation required in summarized in Table 4-6.

Table 4-6 Elderberry Mitigation by Contract

	In Riparian Habitat?	Between 1 and 3 inches, exit holes absent	Between 1 and 3 inches, exit holes present	Between 3 and 5 inches, exit holes absent	Between 3 and 5 inches, exit holes present	Greater than 5 inches, exit holes absent	Greater than 5 inches, exit holes present
Contract 1							
Number Impacted	Yes	0	0	0	0	0	0
	No	0	0	0	0	0	0
Elderberry	Yes	2:1	4:1	3:1	6:1	4:1	8:1

	In Riparian Habitat?	Between 1 and 3 inches, exit holes absent	Between 1 and 3 inches, exit holes present	Between 3 and 5 inches, exit holes absent	Between 3 and 5 inches, exit holes present	Greater than 5 inches, exit holes absent	Greater than 5 inches, exit holes present
Seedling Mitigation Ratio	No	1:1	2:1	2:1	4:1	3:1	6:1
Associated Native Plant Mitigation Ratio	Yes	1:1	2:1	1:1	2:1	1:1	2:1
	No	1:1	2:1	1:1	2:1	1:1	2:1
Total Elderberry Mitigation		**0**	**0**	**0**	**0**	**0**	**0**
Contract 2							
Number Impacted	Yes	0	0	0	0	0	0
	No	22	0	8	5	5	7
Elderberry Seedling Mitigation Ratio	Yes	2:1	4:1	3:1	6:1	4:1	8:1
	No	1:1	2:1	2:1	4:1	3:1	6:1
Associated Native Plant Mitigation Ratio	Yes	1:1	2:1	1:1	2:1	1:1	2:1
	No	1:1	2:1	1:1	2:1	1:1	2:1
Total Elderberry Mitigation		**22**	**0**	**16**	**20**	**15**	**42**
Contract 3							
Number Impacted	Yes	0	0	0	0	0	0
	No	22	0	8	5	5	7
Elderberry Seedling Mitigation Ratio	Yes	2:1	4:1	3:1	6:1	4:1	8:1
	No	1:1	2:1	2:1	4:1	3:1	6:1
Associated	Yes	1:1	2:1	1:1	2:1	1:1	2:1

	In Riparian Habitat?	Between 1 and 3 inches, exit holes absent	Between 1 and 3 inches, exit holes present	Between 3 and 5 inches, exit holes absent	Between 3 and 5 inches, exit holes present	Greater than 5 inches, exit holes absent	Greater than 5 inches, exit holes present
Native Plant Mitigation Ratio	No	1:1	2:1	1:1	2:1	1:1	2:1
Total Elderberry Mitigation		**22**	**0**	**16**	**20**	**15**	**42**
Number Impacted	Yes	0	0	0	0	0	0

The USACE will attempt to perform construction without affecting any other elderberry shrubs by staying outside an established 100-foot buffer zone to the greatest extent possible. However, due to the necessary dimensions of the work areas, it is anticipated that work could occur within the 100-foot buffer zone of some elderberry shrubs. In areas where encroachment on the 100-foot buffer has been approved by the USFWS, the USACE will provide a minimum setback of at least 20 feet from the dripline of each elderberry plant. All work within this buffer shall be conducted under the observation of a qualified biological monitor. Should any buffers be deemed infeasible by the USFWS, the USACE would compensate for the shrubs according to the USFWS 1999 *Conservation Guidelines* for the VELB.

The USACE will also erect signs every 50 feet along the edge of avoidance areas with the following information: "This area is habitat of the valley elderberry longhorn beetle, a threatened species, and must not be disturbed. This species is protected by the ESA of 1973, as amended. Violators are subject to prosecution, fines, and imprisonment." The signs will be clearly readable from a distance of 20 feet and will be maintained for the duration of all construction activities.

The USACE will restore damage done to any buffer areas during construction and provide erosion control and re-vegetate with appropriate native plants per USFWS guidance. No insecticides, herbicides, fertilizers, or other chemicals that might harm the beetle and its host plant will be used in the buffer areas, or within 100 feet of any elderberry plant with one or more stems measuring 1 inch or greater DGL.

Following completion of river bank improvement activities, the USACE will perform a post-construction evaluation of each site containing elderberry plants to determine whether any plants were damaged by construction activities. If damage occurs to elderberry plants, the USACE will consult with USFWS on appropriate mitigation. Each elderberry stem measuring 1 inch or greater DGL that is adversely affected (i.e., transplanted or destroyed) must be replaced, in an approved conservation area, with elderberry seedlings or cuttings at a ratio ranging from 1:1 to 8:1 (new plantings to affected stems). Minimization ratios can be viewed in Table 4-7.

The USACE will transplant all impacted shrubs and/or compensated for them at a conservation mitigation bank approved by the USFWS. Timing and transplant techniques will follow USFWS 1999 *Conservation Guidelines*. A qualified biologist (monitor) will be on-site for the duration of any transplanting of elderberry plants to ensure that no unauthorized take of the VELB occurs. If unauthorized take occurs, the monitor shall have the authority to stop work until corrective measures have been completed. The monitor will then immediately report any unauthorized take of the beetle or its habitat to the USFWS and to the CDFG. At the discretion of the USFWS, a plant that is unlikely to survive transplantation because of poor condition or location, or a plant that would be extremely difficult to move because of access problems, may be exempted from transplantation.

Table 4-7 Minimization ratios based on location (riparian vs. non-riparian), stem diameter of affected elderberry plants at ground level, and presence/absence of exit holes

Location	Stems (DGL)	Exit Holes on Shrub Y/N	Elderberry Seedling Ratio	Associated Native Plant Ratio
Non-riparian	Stems ≥1” & ≤3”	No	1:1	1:1
		Yes	2:1	2:1
Non-riparian	Stems >3” & <5”	No	2:1	1:1
		Yes	4:1	2:1
Non-riparian	Stems ≥5”	No	3:1	1:1
		Yes	6:1	2:1
Riparian	Stems ≥1” & ≤3”	No:	2:1	1:1
		Yes:	4:1	2:1
Riparian	Stems >3” & <5”	No:	3:1	1:1
		Yes:	6:1	2:1
Riparian	Stems ≥5”	No:	4:1	1:1
		Yes:	8:1	2:1

Swainson's Hawk and Other Raptors

Detailed surveys have been conducted for an area including a ½ mile buffer around the construction easements and staging areas for the erosion sites. All Swainson's hawk sightings, nesting behavior, and nest sites have been recorded and mapped in the field.

Direct disturbance, including removal of nest trees and activities in the immediate vicinity of active nests, shall be avoided during the breeding season (March through August) to the greatest extent possible. As feasible, ½ mile no-disturbance buffers will be established around each identified active nest to avoid disturbing nesting birds, where feasible. The size and configuration of buffers will be based on the proximity of active nests to construction, existing disturbance levels, topography, the sensitivity of the species, and other factors and will be established through coordination with CDFG representatives on a case-by-case basis. If possible, the USACE would delay construction and maintenance around individual raptor nests until after the young have fledged.

If disturbance of the nest of a State-listed bird (i.e. Swainson's hawk) cannot be avoided, the project applicant shall obtain a Section 2081 permit. Standard mitigation for the loss of an active nest tree generally requires planting 15 trees (a mix of cottonwood, sycamore and valley oaks) and monitoring the success of the trees for 5 years with a 55% success rate. If disturbance of any bird covered by the MBTA occurs, the project applicant shall consult with the USFWS to determine appropriate mitigation measures. Active nest trees that would not be removed, but are in close proximity to construction activities, shall be monitored weekly to determine if construction activities disturb the adult or young birds, until the birds left the nest.

In the event that a previously unidentified nesting or roosting Swainson's hawks and other raptors are identified within any of the erosion sites, the USACE will coordinate with the CDFG to identify appropriate measures to ensure that these raptors are not adversely affected.

No Swainson's hawk foraging habitat has been identified through habitat assessments. However, if the CDFG views any of the erosion sites as potential foraging habitat, mitigation shall be implemented in accordance with CDFG recommendations. Specifically, if the project area is deemed foraging habitat and is in the vicinity of an active (used during one or more of the last 5 years) Swainson's hawk nest, habitat management (HM) land (in which all HM land requirements shall be met by fee title acquisition or acceptable conservation easement) must be provided. If the project is within 1 mile of an active nest, 1 acre of HM land shall be provided for each acre of development at the erosion site. If the proposed work is within 1 and 5 miles from an active nest, 0.75 acres of HM land shall be provided for each acre of development authorized. Projects within 10 miles of an active nest tree but greater than 5 miles from an active nest tree shall provide 0.5-acres of HM land for each acre of development authorized at a 0.5:1 ratio (CDFG 1994).

Salmon, steelhead, green sturgeon, delta smelt, longfin smelt, and Sacramento splittail

The USACE is committed to implementing avoidance measures and BMPs during construction (Section 4.5.4). A SWPPP and associated BMPs for sediment (Section 4.8.4) are expected to reduce potential short-term impacts due to construction-related leakage or spills of toxic substances, turbidity, suspended sediment, and sediment deposition to less than significant levels. However, because of the overlap in life history timing of special-status fish species with the proposed fall 2008 and 2009 construction window, adult and juvenile Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, delta smelt, green sturgeon, and Sacramento splittail could be present at the erosion sites during in-water construction activities.

Potentially significant short-term impacts to individual fish may therefore occur during construction for the following species and life stages as a result from displacement from preferred habitat, migration delay or disruption, and mortality or injury resulting from placement of rock revetment:

- Sacramento River winter-run Chinook salmon ESU: adult upstream migration, juvenile rearing, and smolt outmigration.
- Central Valley spring-run Chinook salmon ESU: adult upstream migration, juvenile rearing, and smolt outmigration.
- Central Valley steelhead ESU: adult residence, adult upstream migration, juvenile rearing, and smolt outmigration.
- Delta smelt: adult residence, adult upstream migration, spawning and egg incubation, and juvenile rearing.
- Longfin smelt: adult residence, adult upstream migration, spawning and egg incubation, and juvenile rearing.
- Green sturgeon: adult upstream migration and juvenile rearing.
- Sacramento splittail: adult residence, adult upstream migration, spawning and egg incubation, and juvenile rearing.

Several project features provide additional mitigation for project-related impacts. These features were designed to address the need for ecologically functional shallow-water and floodplain habitat in the constrained reaches of the lower Sacramento River. On-site mitigation includes the creation of shallow wetland habitat by constructing wetland benches planted with emergent vegetation at SB 16.6R, CS 21.8R, Sac 52.3L, Sac 16.8L, and F 28.5R (Section 2.5). This habitat is expected to remain inundated year-round.

The planted riparian bench at all sites, and the anchored IWM and fascines added at Sacramento River sites upstream and inclusive of Sac 42.7L, are designed to retain and enhance the structural habitat and hydraulic complexity of the nearshore zones relative to existing conditions. Key objectives include increasing the availability (habitat area), accessibility (frequency of inundation), and quality (shallow water, submerged vegetation and in-stream and overhead cover) of nearshore habitat for rearing Chinook salmon, steelhead, delta smelt, green sturgeon, and Sacramento splittail during periods when they may occur at the erosion sites. These design features are also expected to provide long-term benefits to other native fish species that use nearshore zones and floodplains for spawning and early rearing in the winter and spring (e.g., delta smelt, Sacramento splittail, and possibly green sturgeon).

In addition to the mitigation measures included as part of the project work schedule and design, and those implemented as part of the SWPPP, off-site mitigation would be implemented to compensate for long-term losses of nearshore aquatic and riparian habitat values for Chinook salmon and steelhead adults. Off-site mitigation is described in detail in Section 2.10.

SAM modeling results for Chinook salmon and steelhead (Appendix I) indicate site specific reductions in nearshore habitat values for salmonid adults in summer and fall due to removal of IWM and riparian vegetation and resultant losses of in-stream and overhead cover. These

habitat deficits are effectively mitigated by on-site mitigation features as well as those at nearby sites within adjacent Programmatic Regions (Appendix I). The one potential exception to these findings is that low-level habitat deficits in summer and fall for salmonid juveniles and smolts may were identified at the Sac 177.8R site (Appendix I). Although these habitat deficits are low, prior NMFS (2001) guidance suggests that a suitable mitigation site within 50 miles should be identified and developed to fully compensate for habitat losses at Sac 177.8R. The Corps will purchase or develop a suitable compensation site within 50 miles and analyze it with the SAM to determine the appropriate compensation length.

SAM results for delta smelt (Appendix I) indicate potential long-term adverse impacts on delta smelt and their critical habitat are expected to occur only under summer flow conditions on the Sacramento River. Habitat compensation requirements for delta smelt will be met by applying the habitat created in the Cache Slough/Yolo Bypass Mitigation Area. Prior to 2007, the Cache Slough site offered 12,000 ft and 138 acres (6,011,280 sq ft) of potential habitat compensation. In order to ensure habitat recovery for delta smelt spawning and juvenile rearing within the 2 year recovery period recommended by the SAM (USACE 2004), some 816 linear feet and 3.8 acres (166,650 sq. ft.) of habitat would be applied to delta smelt habitat deficits of sites constructed within Regions 1a and 1b. Considering both the SAM related deficits (816 linear feet and 3.8 acres) and previous compensation of 2,531 ft and 21.9 acres withdrawn from this site (USACE 2008), this would leave a balance of 8,653 ft and 112.3 acres for future delta smelt compensation needs.

Off-site mitigation would also be required to compensate for potential losses of habitat for green sturgeon larva and juveniles, and rearing habitat for Sacramento splittail. However, long-term reductions in summer habitat for young green sturgeon and Sacramento splittail would likely be similar to those described for salmonids, and these impacts are likely less than significant so long as the appropriate avoidance and mitigation measures for salmonids are adopted.

Northwestern Pond Turtle

Implementation of the proposed project could result in the loss and/or degradation of NPT and its habitat. If a turtle is discovered on any of the erosion sites, work shall cease until either (1) the turtle leaves the site of its own volition or (2) a qualified biologist is contacted to relocate the turtle to a suitable downstream location. Implementation of this mitigation measure would reduce potential impacts on the NPT and its habitat to a less-than-significant level.

Special-Status Plants

A qualified botanist shall conduct floristic surveys within erosion sites that provide potentially suitable habitat for the following species during the appropriate bloom-period for those species: Sanford's arrowhead, delta mudwort, Mason's lilaeopsis, delta tule pea, and marsh skullcap. If none of these species are located during floristic surveys, no further mitigation would be required.

If special-status plants are identified during floristic surveys, their locations shall be marked by GPS technology. During construction activities, efforts will be made to avoid direct impacts on any special-status plant species. If impacts to those species cannot be avoided, a qualified botanist shall be present to oversee transplantation of any special-status plant,

which will be moved to a temporary nursery site until such time that the plant can eventually be replanted at the impacted erosion site, following construction activities.

Implementation of the above mitigation measures would reduce impacts on special-status plants to a less-than-significant level.

Short-term construction-related impacts would be partially mitigated by implementing the proposed minimization and avoidance measures (Section 4.2.3) and the on-site and off-site mitigation measures described above and in Section 2.9. With implementation of these measures, and due to the short-term nature of the effects, effects on critical habitat for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, and delta smelt, and EFH for Chinook salmon (all ESUs) are expected to be less than significant. The project would not conflict with the provisions of any Habitat Conservation Plan or Natural Community Conservation Plan for special-status fish or their habitat. However, these measures would not fully avoid or mitigate potential short-term effects on individual fish and take may therefore occur.

Long-term effects on certain life stages of special-status fish and their habitat may be significant. However, with the implementation of off-site mitigation measures (i.e., creation or purchase of offsite habitat) that would be required to offset impacts to Chinook salmon, steelhead, and delta smelt, long-term effects on these species and their critical habitat would be less than significant.

The project would not conflict with the provisions of any Habitat Conservation Plan or Natural Community Conservation Plan for special-status plants or wildlife. With the implementation of the on-site mitigation measures described above, the proposed project would not have substantial adverse effects on special-status wildlife and plants that may be observed during the recommended pre-construction surveys.

4.7 Hydrology and Water Quality

4.7.1 Environmental Setting

The proposed repairs span a large geographic area throughout California's Central Valley, beginning in the deltaic sloughs of Solano County and extending up the Sacramento River system as far north as Glenn County. The majority of the 13 erosion sites, however, are clustered around the Sacramento metropolitan area. The erosion sites are located within the Sacramento River watershed, which drains the northern portion of California’s Central Valley.

Two of the river’s major tributaries, the Feather and American Rivers, drain into the lower reaches of the Sacramento River from the west. The Feather River, which is the largest natural tributary of the Sacramento, originates in the Sierra Nevada and enters the main channel near Verona. The American River joins the Sacramento north of downtown Sacramento. Cache and Steamboat Sloughs drain into the Sacramento River from the east in the lower reaches of the delta (SVWQC 2004).

The average annual flow of the Sacramento River is 19,000 cubic feet per second (cfs) (SVWQC 2004). The channel is generally characterized by deep water and low velocity flows. See Section 4.8 for a complete discussion of channel geomorphology.

On average, over 22 million acre feet of water flow through the Sacramento River watershed each year, making it the largest in California. The Sacramento Valley and its surrounding foothills receive substantial rainfall in the winter and early spring. Historically, this would have resulted in the Sacramento River experiencing maximum flows in December through March, and low flows in the summer, as a result of annual summer drought (Fortier 1909, as cited in Warner 1984). However, current flows have been heavily altered by construction in the waterways, especially dams. Snowmelt is now held in reservoirs and released in response to water needs and flood control (Domagalski 2000). Very little sediment is stored in bars, and the bank-building process typical of lowland alluvial rivers no longer occurs.

Hydrology

River stage is defined as the height of the surface of a river within a channel, above an arbitrary zero point. In the Sacramento, American, and Feather Rivers, this is largely the consequence of upstream dam releases. Flows on the Sacramento River are controlled mainly by Shasta Dam and, to a lesser extent, by dams on the Feather, Yuba, and American Rivers. Runoff from winter rains and snow melt that enters the system is stored in reservoirs and released during the normally dry summer months. Winter flow is dependent upon a number of factors, including reservoir releases and diversions to bypass channels used for flood control, in addition to storm runoff (SVWQC 2004).

Table 4-8 presents the water surface elevation, water slope, and 2-year recurrence interval (RI) approximations of bankfull discharge for each site, as determined based on the nearest available monitoring data.

Table 4-8 Water Surface Elevations

Erosion Site	Mean Water Surface Elevation (feet, NGVD)					Water Slope
	2-yr RI	Winter	Spring	Summer	Fall	
SB 16.6R	5.0	2.9	2.6	2.1	1.9	0.00005
CS 21.8R	6.4	2.9	2.6	2.1	1.9	0.00005
Sac 49.7R	18.2	5.5	4.7	3.8	3.4	0.00003
Sac 52.3L	19.0	6.0	5.1	4.1	3.6	0.00002
LAR 0.3L	19.7	4.9	6.6	5.9	4.5	0.00002
LAR 2.8L	20.0	5.1	6.8	6.1	4.6	0.00001
Sac 53.5R	19.5	6.2	5.4	4.3	3.7	0.00003
Sac 177.8R	101.6	87.3	86.7	86.0	84.4	0.00014
Sac 16.8L	5.0	2.9	2.6	2.1	1.9	0.00005
Sac 42.7R	15.1	5.3	4.5	3.5	2.9	0.00001
Sac 55.2L	20.2	6.5	5.6	4.5	3.9	0.00001

Erosion Site	Mean Water Surface Elevation (feet, NGVD)					Water Slope
	2-yr RI	Winter	Spring	Summer	Fall	
Sac 77.2L	29.2	15.2	13.5	11.7	10.5	0.00005
F 28.5R	49.5	36.4	36.4	37.5	36.0	0.00008

Water quality

Surface water quality can be assessed through several different methodologies. The Sacramento River and its tributaries are generally characterized by good water quality. This has been largely attributed to the overall size of the main channel and the purity of the snowmelt, which serves as the water source for the system.

As water flows through the Central Valley, its quality typically degrades with increased entrainment of fine particulate matter and agricultural return flows. Other sources of potential degradation include waste discharges such as treated municipal wastewater, urban storm water runoff, and irrigated agricultural return flows. These inputs can increase TSS, particularly if sediment BMPs are not yet in place in surrounding areas.

Contaminant issues known to impact the water quality of the Sacramento River basin are acid mine drainage, agricultural runoff, sources of dioxin (paper mill), mercury inputs, and municipal non-point source pollution. Mercury, a contaminant of particular concern, has been detected at elevated level in the American and Feather Rivers by the California State Toxic Substance Monitoring Program. Further contaminants enter the system as a result of runoff from orchards, rice fields, and pastures, and effluent from treatment plants and municipal sources (USGS 2007).

Several reaches of the Sacramento River and its tributaries have been classified as *impaired* (DWR 2006). This designation is given to streams for which a standard of water quality for beneficial uses (such as drinking water and water for recreation) have not been met. The Sacramento River system is classified as impaired for organophosphate pesticides and mercury (CalEPA c2007). The objectives for these contaminants were only exceeded during conditions of stormwater runoff in a study period between 1994 and 1998, indicating that non-point source pollution is a major factor in the Sacramento River's water quality (Domagalski 2000). The majority of pesticides (orthophosphate and carbamate) and trace organics were not detected above their respective reporting limits during any of the sampling events.

The Sacramento Regional County Sanitation District, the County of Sacramento Water Resources Division and the City of Sacramento jointly established the Sacramento Coordinated Water Quality Monitoring Program for ongoing and future Sacramento-area water quality monitoring programs on the Sacramento and American Rivers. The monitoring program samples the Sacramento and American Rivers 6 times a year and publishes results. The latest results (for the year 2006 to 2007) include monitoring results for 3 sites on the Sacramento River (at the Interstate 5 Veterans Bridge near Alamar Marina, at Freeport Marina, and at RM 44), and 3 sites on the American River (below Nimbus Dam, Business 80 Overpass, and at Discovery Park).

Water quality parameters measured from 2006 to 2007 included trace metals (arsenic, cadmium, chromium, copper, iron, lead, mercury, methyl mercury, molybdenum, nickel, silver and zinc), conventional parameters (hardness, pH, dissolved oxygen, temperature, conductivity, total organic carbon, dissolved organic carbon, chloride, total dissolved solids and total suspended solids), organophosphate and carbamate pesticides, coliform bacteria, cyanide, UVA 254, nutrients (nitrogen and phosphorus species) and selected trace organic compounds (herbicides, PAHs, semi-volatile organics and MTBE). Water quality data for 2006 to 2007 were compared to the lowest relevant water quality objectives from the California Toxics Rule (CTR) and the Water Quality Control Plan (Basin Plan) for the Sacramento River watershed, along with the Sacramento area NPDES Stormwater Permit (No. CAS082597, Order R5-2002-0206) criteria for diazinon and chlorpyrifos (SRCSD 2007).

The upper reaches of the Sacramento River generally have excellent mineral and nutrient quality, with typical total suspended solids (TSS) concentrations of 1 to 5 milligrams per liter (mg/L) during summer and fall months, to 50 to 100 mg/L during winter and spring (USACE 2006b). Seasonal and storm-event variability in TSS is due to the intermittent hydrology of the region, with increasing and decreasing TSS concentrations respectively, as streamflow rises and falls during storms.

USACE prepared a 2006 EA for five erosion repair sites on the Sacramento River, which described water quality. Two of the five sites' locations were within the range of the 13 current sites, and therefore water quality information for these two sites (RM 72.2R and 34.5R) can be used to provide baseline environmental quality information. Analysis of this data indicated that TSS are highest in the Sacramento River in December though March, peaking at 139 mg/L in December at RM 72.2R and at 153.9 mg/L in January at RM 34.5R. The lowest TSS levels were recorded in July at RM 77.2R (at 33 mg/L) and in October at RM 34.5R (at 19.4 mg/L).

Mean monthly TSS concentrations may be considered equivalent to turbidity, with an approximate conversion of 1–1.5 Nephelometric Turbidity Unit (NTU) per mg/L TSS, dependent upon parent geology of the suspended materials (APHA 1998). Turbidity is determined by the cloudiness or haziness of a fluid caused by individual particles (suspended solids) that are generally invisible to the naked eye. As recorded for water collected from the Sacramento River at the Verona and Freeport gauges, mean monthly TSS ranges from 19.4 mg/L (October at Freeport) to 153.9 mg/L (January at Freeport) (USGS 2008). These sites display the typical seasonal pattern displayed in upper Sierran watersheds, where TSS levels are highest during winter (December through February) months and lowest during summer (June through August) and fall (September through November).

The majority of the constituents measured in 2006 to 2007 indicated compliance with existing water quality objectives. Mercury concentrations in the American River and the Sacramento River for 2006 to 2007 were all below the CTR human health criterion (50 ng/L total mercury). In the 2005 to 2006 sampling year, the majority of trace metals were below their respective regulatory concentration limits for sites on both the American and Sacramento Rivers. However, some occurrences of aluminum and iron were reported from the Sacramento River. Bacteria levels (*Escherichia coli* [E. coli] and Fecal Coliform) exceeded Basin Plan objectives during three sampling events on both the American and

Sacramento Rivers. Exceedances primarily occurred in samples collected during wet weather events, but one E. coli exceedance was reported during dry weather.

Sampling also occurs in the delta. Eleven sampling sites representing eight regions of the upper San Francisco Estuary were monitored by DWR in 2003 for a variety of physical and chemical water quality parameters. DWR also conducted a series of special studies to monitor dissolved oxygen (DO) levels during the late summer and early the fall of 2003. The studies were conducted to determine if DO levels dropped below state (5.0 mg/L) and regional (6.0 mg/L) water quality objectives established for the delta. Monitoring results showed DO concentrations in the delta ranged from 3.0 mg/L to 10.7 mg/L and consistently fell below both the 5.0 mg/L and 6.0 mg/L objectives in 2003 probably due, in part, to relatively low net flows in the San Joaquin River past Stockton and warm water temperatures.

4.7.2 Regulatory Setting

4.7.2.1 Federal and State Laws and Regulations

Clean Water Act

The Clean Water Act (CWA) is contained in Volume 40 of the Code of Federal Regulations. The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Section 301 prohibits the discharge of any pollutant into the Nation's waters without a permit, and Section 402 establishes the permit program.

The CWA requires that states maintain a listing of impaired water bodies that do not meet water quality standards and are not supporting beneficial uses. These waters are placed on the Section 303(d) List of Impaired Waterbodies. Placement on this list triggers development of a pollution control plan called a Total Maximum Daily Load (TMDL) for each water body and associated pollutant/stressor on the list.

The USACE regulates “waters of the United States,” which are defined as inter and intra state waters and wetlands, as well as their tributaries, under the CWA. Section 404 of the CWA regulates activities that result in discharge of dredged or fill material into waters of the United States. The CWA requires that an applicant for a Section 404 permit (to discharge dredged or fill material into waters of the United States) first obtain a certificate from the appropriate state agency stating that the fill is consistent with the State’s water quality standards and criteria. In California, the authority to either grant certification or waive the requirement for permits is delegated by the SWRCB to 9 regional boards. A request for certification or waiver is submitted to the regional board at the same time that an application is filed with the USACE. The regional board has 60 days to review the application and act on it. Because no USACE permit is valid under the CWA unless “certified” by the state, these boards may effectively veto or add conditions to any USACE permit.

States are required under section 303 of the CWA to adopt water quality standards for all surface waters of the United States. Where multiple beneficial uses exist, water quality standards must protect the most restrictive beneficial use. The State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCB) are responsible for ensuring implementation and compliance with the provisions of the federal CWA. The RWQCB regulates all water bodies within its scope, but has special responsibility for riparian

areas and wetlands, which have a high resource value, are vulnerable to filling, and are not systematically protected by other programs. The proposed project is within the jurisdiction of the Central Valley RWQCB, which is charged with the protection of the Sacramento and San Joaquin Rivers and their tributaries.

The CWA authorizes the USEPA to regulate issues related to soil erosion for the purpose of water quality protection resulting from construction activities. Section 402(p) establishes a framework for regulating stormwater discharges into surface waters by issuing National Pollutant Discharge Elimination System (NPDES) permits that establish pretreatment standards for discharged water.

The RWQCBs implement these permits at the state level, but USEPA may retain jurisdiction at its discretion. In accordance with NPDES regulations, the state requires that any construction activity affecting one acre or more attain coverage under a General Construction Activity Stormwater Permit to minimize the potential effects of construction runoff on receiving water quality. Permit applicants are also required to prepare and implement a SWPPP that specifies erosion and sediment control BMPs to reduce or eliminate construction related impacts on receiving water quality.

The SWPPP must identify sources of sediments, describe and ensure implementation of BMP's, initiate a monitoring program to inspect the site before and after storm events, and ensure that equipment, materials, and workers are available for response to failures or emergencies. All dischargers must certify annually that construction activities are in compliance with the General Permit.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Act is enforced by the SWRCB and the RWQCBs. The Porter-Cologne Act defines "waters of the state" as water bodies with boundaries within the state, including any surface or groundwater, whether fresh or saline. The intent of the act is to provide a comprehensive program for the protection of water quality and beneficial uses of water through the regulation of waste discharges. Waste discharges may include such substances as wastewater effluent and discharges of fill and dredged material to waters of the state.

California Fish and Game Code

Under sections 1600-1616 of the California Fish and Game Code, the CDFG regulates activities that would substantially divert, obstruct, or change the natural flow of a river, stream, or lake; substantially change the bed, channel, or bank of a river, stream, or lake; or use material from a streambed. In practice, CDFG marks its jurisdictional limit at the top of the stream or lake bank, or the outer edge of the riparian vegetation, where present, and sometimes extends its jurisdiction to the edge of the 100-year floodplain.

Any activity within a stream zone (which includes the riparian vegetation associated with perennial, intermittent, and ephemeral streams) or lake that might substantially divert, obstruct, or change the natural flow, or alter the bed or bank requires a notification package and fee on file with CDFG before project activities begin. The use of material from streams and lakes, in addition to the deposition or disposal of debris in locations where it could eventually end up in a lake, are also regulated under Section 1602 of the code. Lake and Streambed Alteration Agreements are required where project mitigation measures do not substantially reduce a project's effects. However, since the proposed action is a federal

project, obtaining a Streambed Alteration Permit is not necessary.

California Code of Regulations Section 3831(k)

Title 23 CCR Section 3831(k) requires an applicant to obtain a federal license or permit to conduct an activity which may result in discharge into navigable waters, and obtain a certification from the state that any such discharge will comply with the applicable provisions of the CWA Sections 301, 302, 303, 306, and 307.

California Wetlands Conservation Policy

The California Wetlands Conservation Policy is a compilation of strategies ensure a long-term net gain in quantity and quality of wetland acreage. The policy establishes a framework to reduce procedural complexity in the administration of state and federal wetlands conservation programs. In addition, the policy encourages a partnership between landowners and state and federal agencies with incentive programs focusing on wetland conservation and restoration.

4.7.2.2 Local Laws and Regulations

American River Parkway Plan

The water policies contained in the American River Parkway Plan state that water quality "shall be maintained to provide for beneficial uses of the river."

City of Sacramento General Plan

The policies of the draft 2030 General Plan protect water quality through a variety of methods, including: conservation of Open Space Areas and drainage canals; working with federal, state, local and private watershed organizations to improve water quality and provide habitat protection; and control of post-development peak storm water runoff discharge rates and velocities to prevent or reduce downstream erosion and to protect habitat.

City of West Sacramento General Plan

Section VI, Goal A of the General Plan is to protect water quality, specifically in the Sacramento River and the Deep Water Shipping Channel. This goal is met through implementing measures to minimize the discharge of sediment into watercourses.

City of Yuba City General Plan

The General Plan includes policies to guide the enhancement of the quality of surface water and the natural condition of the Feather River waterway. Storm water pollution is controlled to prevent oil and sediment from entering the river. For park improvements, a buffer zone is required along the river in which no grading or construction activities occur. The General Plan further recommends that: restoration plans include: performance standards and contingency plans if re-planting is not successful; and placement of construction materials, spoils, or fill somewhere other than in the river or located so that they can be washed into the river.

Glenn County General Plan

The Glenn County General Plan identifies the protection of water quality as a major goal. To meet this goal, it is the policy of the county to comply with all state and federal regulations and zone floodways in a manner that supports water quality.

4.7.3 Environmental Effects

Effects on water quality that could result from the proposed construction activities are evaluated on the basis of construction designs, practices and materials to be used, location and duration of activities, and the potential for water quality or beneficial use degradation. Operational effects on surface hydrology and water quality are determined by evaluating each repair site's potential to significantly alter surface runoff patterns, increase the quantity of runoff, or generate additional sources of pollution.

An effect is considered to be significant and to require mitigation if it results in any of the following:

- Alteration in the quantity and quality of surface runoff;
- Degradation of water quality;
- Violation of any water quality standards or waste discharge requirements;
- Substantial alteration of the existing drainage pattern of the site of area, such that flood risk and/or erosion and siltation potential would increase;
- Placement of structures that would impede or redirect flood flows within a 100 year flood plain;
- Exposure of people, structures, or facilities to significant risk from flooding, including flooding as a result of the failure of a levee or dam;
- Creation or contribution to runoff that would exceed the capacity of an existing or planned stormwater management system; or
- Reduction in groundwater quantity or quality.

4.7.3.1 Alternative 1: Proposed Action

Water quality impacts, which could potentially result from the proposed construction activities include the restriction of floodway and channel capacity, accelerated erosion or sedimentation, short-term temporary increases in turbidity levels during construction, and inadvertent release of petroleum products used to fuel and maintain construction equipment.

The placement of riprap within the channel would temporarily generate increased turbidity in the immediate vicinity of each erosion site, and could result in a plume of sediments suspended in the water column exceeding levels identified as acceptable by the Basin Plan (the Basin Plan identifies a change in turbidity above 10% of the ambient turbidity as significant) (CRWQCB 1998).

Small volumes of petrochemical products (e.g., fuel, engine oil, hydraulic line oil) would be temporarily used and handled to operate construction equipment. There is a danger that these materials may be released in accidental spills and result in harm to the environment.

Although the proposed project may reduce the section width by 5 to 20 feet in the construction area, normal water fluctuations would not be affected. The project would not affect stage elevations. Some changes to the shoreline contour are anticipated due to the proposed fill, however, engineering design has been completed to ensure little or no changes in general current and flow patterns, see Section 4.8.

Temporary changes in particulates and turbidity would occur during construction. There would not be significant long-term changes in suspended particulates and turbidity. It is anticipated that turbidity would increase by 5 to 10 NTUs (approximately 5 to 10%) above

ambient levels during construction activities. It is anticipated that an increase of <20% above ambient levels would be acceptable to the RWQCB based on previous bank protection projects in the area.

The proposed erosion repair sites have been designed to maintain existing floodway capacities and avoid significant effects to channel hydrology. Placement of rock beneath the water line during construction would result in moderate ground disturbance and minimal, temporary alterations in drainage patterns. Furthermore, rock placement could result in increased turbidity in the immediate vicinity of the repair sites. Minimal turbidity may also result from loose soil entrained in stormwater runoff during ground disturbance, or wave action generated during boat and barge operations at those sites with waterside construction. Ground disturbance could increase the potential for localized erosion and sedimentation, and the effect to water quality from the placement of rock on silts and sands within the river has the potential to be significant.

4.7.3.2 Alternative 2: Thin Rock Armor

Under this alternative, a thin layer of rock slope protection would be placed on the levee slope to prevent further erosion. Placement of rock beneath the water line during construction would result in moderate ground disturbance and minimal, temporary alterations in drainage patterns. Furthermore, rock placement could result in increased turbidity in the immediate vicinity of the repair sites. Minimal turbidity may also result from loose soil entrained in stormwater runoff during ground disturbance, or wave attenuation generated during boat and barge operations at those sites with waterside construction.

As in Alternative 1, ground disturbance could increase the potential for localized erosion and sedimentation. Impact to water quality would be significant.

4.7.3.3 Alternative 3: No Action

Under this alternative, no action would be taken to halt the erosion and protect the levee at the 13 erosion repair sites. Erosion would continue, increasing the risk of levee failure and subsequent flooding.

Potential effects to water quality from this alternative include increases in total suspended solids and turbidity, both chronically (as levees continue to erode) and acutely (in the event of a levee failure). Water quality impacts from a levee failure in which water floods urban, suburban, and agricultural areas would be wide-ranging and severe. Of particular concern would be those water quality impacts affecting public health, such as the spread of bacteria and viruses that cause disease. Less immediately threatening would be water quality degradation from chemical pollution such as oil and grease, pesticides, heavy metals, and nutrients.

4.7.4 Mitigation

Standard pollution prevention measures, including erosion and sediment control measures, good housekeeping, proper control of non-stormwater discharges, and hazardous spill prevention and response measures would be implemented as part of the project design. The following pollution prevention measures would be implemented to reduce potential water quality impacts to a less-than-significant level.

Storm Water Pollution Prevention Plan

A SWPPP would be implemented during and after construction to minimize turbidity-generating activities. The SWPPP would include an erosion control plan, a water quality monitoring plan, a hazardous materials management plan, and BMPs for construction activities, including the use of a floating turbidity curtain, as appropriate. The BMPs would be maintained until terrestrial areas disturbed during construction have been adequately revegetated and stabilized.

Water quality monitoring, as detailed in the SWPPP, would contain specific directives as to the sampling location, and acceptable levels of turbidity and settleable solids. Sampling would be conducted at an upstream location in the vicinity of each construction site once daily to establish background levels. Water samples for determining down-current turbidity and settleable solid levels would be collected 5 feet from the shoreline and 300 feet down current of any floating turbidity curtain.

Turbidity would not be permitted to exceed 1 NTU above the ambient level, where those levels are between 0 and 5 NTU. Where natural turbidity is between 5 and 50 NTUs, increase shall not exceed 20 percent of ambient levels. Where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs above ambient levels. In areas with a natural turbidity greater than 100 NTUs, increases shall not exceed 10 percent of ambient levels. In determining compliance with these turbidity limits, averaging periods may be applied, provided that beneficial uses remain fully protected.

During working hours, settleable solids shall not exceed 0.1mL/L, after one hour of settling. If either turbidity or settleable solid measurements exceed the values listed above, the contractor shall slow or stop construction until compliance is achieved.

Hazardous Materials Management Plan

The contractor shall develop and implement a hazardous materials management plan prior to initiation of construction which includes BMPs to reduce the likelihood of spills of toxic chemicals and other hazardous materials during construction. It will describe a specific protocol for the proper handling and disposal of materials and contingency procedures to follow the event of an accidental spill. It will also describe the specific protocol for the proper handling and disposal of materials that may be encountered during construction. Any spills of hazardous materials to the river require the immediate notification of CVRWQCB, NMFS, and USFWS. Please refer to Section 4.12 for a complete discussion of hazardous materials related mitigation measures.

Clean Water Act Section 404 Permit

A 404(b) 1 analysis for the project under the CWA is shown in Appendix K. The water quality certification application and fee are shown in Appendix J.

Contractors shall also obtain and comply with the conditions of a state General Construction Activity Stormwater Permit adopted by the California State Water Resources Control Board. The general permit is intended to ensure compliance with state water quality objectives and water protection laws and regulations, including those related to waste discharges. Permit applicants are required to prepare and retain at the construction site a SWPPP that implements BMPs and a Water Pollution Control Program (WPCP). The stormwater quality management program will address project construction and will specify control measures and

BMPs designed to minimize sedimentation and release of products used during construction (e.g., petroleum products, paints, cements, etc.) into adjacent water bodies.

To reduce this impact to a less-than-significant level, the USACE will prepare and implement appropriate SWPPP, BMPs, and WPCP measures. Implementation of these measures would reduce water quality effects to a less-than-significant level.

4.8 Geomorphology

This section discusses potential geomorphic impacts related to proposed bank protection activities at 13 sites within the SRBPP that have been identified as failure risks due to erosion on the watersides of the levees. Impacts to geomorphic processes analyzed include: channel bed and bank erosion, channel migration, sediment storage and recruitment, and IWM storage and recruitment.

4.8.1 Environmental Setting

The project is located in the Sacramento Valley, which is the northern portion of the Great Valley Basin of California. The basin is an elongated synclinal trough that is bounded by the Sierra Nevada plutonic complex to the east and the California Coast Ranges to the west. The Sacramento Valley is underlain by marine sedimentary rocks overlain by recent alluvial deposits, and to a lesser extent some volcanic rocks.

The levees and river sediments associated with the erosion sites are composed of Quaternary alluvium deposits comprised of loose to medium dense, unweathered gravel, sand, silt and clay. These sediments are estimated to have been deposited 200 to 10,000 years before present in naturally formed levees and floodplains along the Sacramento River.

Historically, the Sacramento River migrated frequently, moving freely within its meander belt width that typically exceeded several thousand feet (Buer 1984). Prior to Indo-European settlement, the mainstem Sacramento River and tributaries along the valley floor would overtop naturally formed levees on an annual basis, spilling into adjacent floodbasins, recharging wetlands, and depositing fertile sediments on the floodplain. Despite extensive overbank sediment deposition, these floodbasins have maintained a topographic low, which indicates that they are subsiding at a rate equal to or greater than overbank deposition (Gilbert 1917 and WET 1989). These floodplains have historically provided crucial fluvial geomorphic roles for the Sacramento and Feather Rivers; water retention in the floodbasins causes mainstem flow to decrease in the downstream direction in the river's lower reaches (WET 1990).

Beginning in the late 1800s, the Sacramento River’s channel morphology and sediment transport regime have been increasingly altered by human activities including clearing riparian vegetation, and construction of levees and dams for flood control and water supply. Bank armoring of the project levees under the SRBPP as well as by private interests has resulted in lower sinuosity, fewer overbank flows, and an altered pattern of channel migration and meander cutoff (Brice 1977, Larsen et al 1997, 2004, Larsen and Greco 2002). The present-day Sacramento River is a single-thread channel progressing from a coarse gravel bed upstream, which transitions into a sand-bedded channel by about RM 128 with occasional outcrops of cemented alluvial deposits (Modesto Terrace) that historically provided natural constraints to lateral migration. The morphology of the Sacramento River is

further described below, using the following three reach designations:

- Reach 1: from Collinsville to Verona (RM 0–80)
- Reach 2: from Verona to Colusa (RM 80–143)
- Reach 3: from Colusa to Chico Landing (RM 143–194)

Reach 1

The river is narrowly confined in Reach 1 (except in the lowermost few miles) by large levees at the channel margin that largely block the river's access to historical tidal wetlands and seasonally inundated floodplains. Downstream from the Feather River confluence (RM 80), the river is mildly sinuous (with an average sinuosity of about 1.3), with a uniform channel width and a centerline that does not migrate. The channel is typically narrower and deeper than in upstream reaches (Brice 1977). Historically, deposition of fine sediment that graded from sand to silt in the downstream direction, formed extensive natural levees along the river, from 5 to 20 feet above the floodplain for as far as 10 miles from the channel (Thompson 1961). The present day channel is flanked by fine-grained cohesive banks with erosion due to both mass failures and fluvial erosion.

In the lowermost portion of Reach 1, low velocities predominate as flow is distributed in a network of delta channels and sloughs bordered by relatively low levees consisting of both natural bank materials and revetment (JSA 1987). Tidal influence extends up the Sacramento River for 80 miles to Verona, with greater tidal variations occurring at the downstream end during low river stages. The major tidal sloughs included within the SRBPP in this reach are Three Mile, Steamboat, Sutter, Miner, Georgianna, Elk, and Cache sloughs.

Revetment frequency in Reach 1 varies from 59% of the channel shoreline in RM 0–20 to 76% of the channel shoreline from RM 20–80 (Table 4-10). Such extensive bank protection indicates limited potential for bank erosion or channel migration within the reach. In comparison, the revetment frequency on the lower American River is lower (23%) and increases in the downstream direction. The six Sacramento River sites between RM 15 and 60 are surrounded by reaches that are extensively armored on both sides of the channel, as is the site at SB 16.6R. Revetment is less extensive in the areas surrounding Sac 77.2L, with armoring focused primarily on outer banks of meander bends, where erosion potential is highest. These conditions are similar to those near the two sites on the Lower American River (LAR 0.3L and 2.8L). The bank composition of the proposed protection sites within Reach 1 is either revetment (e.g., concrete, rubble, large or medium rock/cobble) or natural material that is directly upstream or downstream of an existing armored bank (Table 4-10)—repair would essentially be an extension of the existing revetment. The amount and degree of the currently armored sites varies, as some of the sites have extensive revetment (e.g. Sac 49.7L), while others sites only have revetment on the upper levee slopes away from the low water active channel (e.g., Sac 53.5R), and still others only have remnants of former revetment projects as the majority has eroded away (e.g., Sac 77.2R).

IWM loading in the Sacramento River along the channel shoreline is estimated at 10% of the shoreline from RM 0–20 and 16% from RM 20–80, similar to other reaches on the Sacramento River (Table 4-9). At the proposed bank protection sites within Reach 1, IWM is less than the reach average at low flow levels (in summer and fall), ranging from 0% to 8% across the Sacramento and American River sites and the Cache and Steamboat slough sites

(Table 4-10). The IWM loading during the higher flow level (in winter and spring) is generally the same, except at two of the sites (Sac 49.7L and Sac 52.3L), where the high flow IWM amount is equal to or greater than the reach average.

Reach 2

The middle reach (RM 80–143), which lies between the Feather River (RM 80), and the Colusa Weir (RM 146.5) is predominately a sinuous single-thread channel with uniform width, an average sinuosity of about 1.8 (Brice 1977), and an average slope of 0.00003 to 0.0001 (one-tenth to one-half the slope of RM 143–194). The lack of diversity of channel form in this reach is due in large part to adjacent levees and riprap on both sides of the channel. Levees within this reach are generally constructed near the river bank, except at a few locations where they are set back to provide overflow across major meander bends (JSA 1987). A narrow berm of natural substrate inside of the levees occurs in some portions of the reach, providing some erodable substrate; however, erosion and deposition are probably greatly diminished from reference conditions (USFWS 2001). In contrast to downstream reaches, floodplain sediments in this reach are generally much finer and cohesive.

The percent of channel shoreline with revetment is 60% from RM 80–143 and the IWM loading is estimated at 16% of the channel shoreline within Reach 2 (Table 4-9). The Feather River site at RM 28.5R is comprised of existing revetment (Table 4-10) that has been undermined by toe erosion along an outer bend. Within the lower Feather River downstream of the site, lower levels of revetment were inventoried (9%) than found in the corresponding reach of the mainstem Sacramento River (60%) within Reach 2 (Table 4-9). Overall, the majority of high-erosion-potential areas are armored and located on outer banks at meander bends. IWM loading at F 28.5R is relatively low (Table 4-10), but comparable to loadings found in other surveyed reaches of the lower Feather River (7% at RM 28.5R vs. 8% reach-wide).

Reach 3

In the uppermost reach above Colusa (RM 143–194), the river migrates through alluvial deposits between widely spaced project levees. Although levees have not been constructed in much of the uppermost reach, the river bank is constrained from migration by riprap and other structures along one-third to one-half of the reach length (JSA 1987). Reach 3 is predominately a meandering single-thread channel, with a reach-average sinuosity of about 1.4 to 1.5 (Brice 1977) and average energy-grade slopes from the USACE HEC-RAS modeling ranged from 0.0002 to 0.0003 (USACE 2004). The channel is flanked by coarser-grained floodplain sediments with a median bed material size (D_{50}) of approximately 15 mm (WET 1989). These materials generally provide a non-cohesive sand or gravel toe to the banks.

From RM 143–194, the percent of channel shoreline with revetment is 16%, significantly lower relative to reaches further downstream (Table 4-9). The majority of revetment within this reach was placed on the outer bank of meander bends where erosion potential is high. The bank material at the one proposed repair site (Sac 177.8R) within Reach 3 is revetment on the upper levee shoulder and cohesive silt and clay near the low flow water elevation. In the ten miles downstream of erosion site Sac 177.8R there is almost no revetment and the channel is free to laterally migrate, but in the ten miles upstream there is revetment on about half of the outer banks at meander bends (thus inhibiting migration). IWM loading within

Reach 3 is estimated at 17% of the channel shoreline, and no IWM was observed at Sac 177.8R at either the low or high flow water levels (Tables 4-9 and 4-10).

Table 4-9 Existing Physical Bank Conditions by Water Body within the SRBPP Action Area

Water Body	Shoreline length (feet)	Revetment length (feet and % shoreline)	IWM (feet [linear distance of shoreline] and % shoreline)
Reach 1a (Sacramento RM 0-20)			
Sacramento River (RM 0-20)	200,500	119,100 (59%)	19,400 (10%)
Steamboat Slough	125,000	100,100 (80%)	22,200 (18%)
Reach 1b (Sacramento RM 20–80)			
Sacramento River (RM 20-80)	654,100	493,800 (76%)	103,500 (16%)
American River (RM 0–11)	142,900	32,300 (23%)	21,500 (15%)
Cache Slough	35,100	8,600 (25%)	0 (0%)
Reach 2 (Sacramento RM 80–143)			
Sacramento River (RM 80-143)	662,600	398,300 (60%)	108,600 (16%)
Feather River (RM 0-61)	670,100	58,300 (9%)	144,300 (22%)
Reach 3 Sacramento River (RM 143-194)			
Sacramento River (RM 143-194)	577,500	94,500 (16%)	97,800 (17%)

Data from USACE revetment database (USACE 2007a).

Table 4-10 Existing Bank and IWM Conditions at the 13 Erosion Sites

Water Body	Site	Approx. Site Length (feet) [1]	Planform Location	Existing Bank Material [2]		Existing IWM Structure (% shoreline) [3]	
				revetment vs. natural	Average D50 (in)	Winter / Spring	Fall / Summer
Cache Slough	RM 21.8R	950	straight reach	natural [4]	0.25	23	13
Steamboat Slough	RM 16.6R	410	outer bend	revetment	16	17	11
Feather River	RM 28.5R	1,180	outer bend	revetment	8	7	3
Lower American River	RM 0.3L	340	inner bend	natural [4]	0.25	1	1
	RM 2.8L	320	outer bend	natural [4]	0.25	13	8
Sacramento River	RM 16.8L	650	outer bend	revetment	20	3	0
	RM 42.7R	190	straight reach	revetment	6	43	24
	RM 49.7L	250	straight reach	revetment	16	32	5
	RM 52.3L	1,160	straight reach	natural [4]	0.25	18	6
	RM 53.5R	450	inner bend	revetment [5]	> 20	0	0
	RM 55.2L	690	straight reach	natural [4]	0.25	11	9
	RM 77.2L	450	outer bend	revetment [5]	> 20	0	0
	RM 177.8R	1,000	outer bend	revetment [5]	8	0	0
Total		**8,040**					

[1]Site lengths for the 13 sites provided by Ayres Associates (Ayres 2008). Lengths were calculated as the straight-line distance between the upstream and downstream ends of each site, which slightly underestimates the

true site lengths due to channel curvature, bank topography, and seasonal variations in water surface elevations.

[2]Data based on 2007 field inventories by Parus Consulting and Stillwater Sciences and some instances supplemented with data from the USACE revetment database (USACE 2007a).

[3]Data based on 2007 field inventories by Parus Consulting and Stillwater Sciences.

[4]Erosion protection sites were identified as having natural bank conditions during field inventories, but USACE revetment database (USACE 2007a) indicates there is extensive bank revetment immediately upstream and/or downstream of the sites.

[5]Erosion protection sites have natural bank material at low flow elevations but are armored with revetment along the upper berm / levee faces and are considered primarily resistant to bank erosion and channel migration.

4.8.2 Regulatory Setting

4.8.2.1 Federal and State Laws and Regulations

Clean Water Act

The Proposed Action alternative requires placing materials (rock revetment) in the waters of the United States. Temporary re-suspension of sediments in the nearby area is likely. A Section 401 water quality certification addressing these activities is included in Appendix J and the 404(b)(1) evaluation for the project is included as Appendix K. The CWA's section 404(b)(1) guidelines for evaluation of discharges of dredged or fill materials provide specific guidance in Subpart C for evaluating significant impacts to the substrate of the aquatic ecosystem, turbidity, current patterns and water circulation, and normal water fluctuations in a natural aquatic system consisting of daily, seasonal, and annual tidal and flood fluctuations in water level. These include factors that cause "significant degradation of the Waters of the United States," with emphasis on the persistence and permanence of effects.

CDFG Streambed Alteration Agreement

Under sections 1600–1616 of the California Fish and Game Code, the CDFG regulates activities that would substantially divert, obstruct, or change the natural flow of a river, stream, or lake; substantially change the bed, channel, or bank of a river, stream, or lake; or use material from a streambed falls under CDFG jurisdiction. In practice, CDFG marks its jurisdictional limit at the top of bank, or the outer edge of the riparian vegetation, where present, and sometimes extends its jurisdiction to the edge of the 100-year floodplain. However, since the Proposed Action is a federal project, obtaining a Streambed Alteration Permit is not necessary.

4.8.3 Environmental Effects

Effects on geomorphic processes that could result from construction activities were evaluated on the basis of construction designs, hydraulic modeling, materials to be used, and the location and duration of the activities. Operational effects on geomorphic processes were evaluated on the basis of the proposed project's potential to significantly alter channel bed and bank erosion, sediment storage and recruitment, channel migration, and IWM storage and recruitment.

Thresholds for significance of impacts to geomorphic processes from implementation of the bank protection sites are in part based on relevant environmental laws and on interpretation of the general physical context of the changes in channel morphology, sediment regime, and

IWM processes. An effect was considered to be significant if it would result in one or more of the following:

- Alteration in channel erosion and migration processes;
- Changes in the local hydraulics;
- Loss of sediment supply; or
- Loss of IWM loading and recruitment.

4.8.3.1 Alternative 1: Proposed Action

Under alternative 1, bank protection measures would be added to prevent ongoing erosion and increase levee stability. The proposed bank protection measures include: (1) protecting the toe and upper slopes of the bank with riprap; (2) establishing a bench around the MSWL to provide aquatic habitat during higher river stages in winter and spring; (3) placing anchored IWM for aquatic habitat; and (4) planting pole and container plantings to stabilize the bank and provide riparian and SRA habitat.

The proposed actions would result in placing rock revetment on approximately 8,040 feet of channel length for all sites combined, with slightly over half of that occurring on the Sacramento River. This will prevent bank erosion and subsequently preclude recruitment of local sediment and IWM from the banks for an estimated design life of 50 years. The bank revetment will contribute to fixing the channel planform position by limiting lateral channel migration, and thus may potentially limit the development of off-channel habitats such as oxbow lakes (Larsen et al. 1997, 2004; Larsen and Greco 2002).

However, the proposed bank repairs in this action areas are not expected to alter the overall geomorphic trajectory of the reaches affected by the proposed actions for several reasons including (1) the repairs are due to occur at sites that are currently armored or are bounded directly upstream and downstream by reaches with bank revetment, and (2) the river channel is constrained by levees and bank revetment within the vicinity of the sites. Irrespective of the proposed actions, the planform position of the Sacramento River is already more or less fixed in place—and the channel thus has limited opportunity for lateral migration or sediment recruitment from its banks; approximately 191.5 miles of bank revetment occur within Reaches 1 and 2 (RM 0–143) according to the USACE 2007 revetment database (USACE 2007a),. Moreover, potential sediment recruitment from these sites represents a small fraction of the overall Sacramento River basin sediment budget. Due to the lowland watershed position of the erosion repair sites, bank materials are the sand-sized and finer; reducing sediment recruitment from such banks would not contribute to the loss of spawning sized material for anadromous fish species. Although the site located at Sac 177.8R is within the gravel and cobble dominated reaches of the Sacramento River, the bank material is locally composed of cohesive silt and clay deposits; reducing bank erosion at the site would not cause any additional loss of spawning sized material in the reach. Overall, potential impacts of ending bank erosion can reasonably be judged to be insignificant.

The proposed actions and construction related activities would result in both temporary and long-term impacts on the riparian forest as well as future IWM recruitment to the channel. Impacts to the riparian forest canopy are likely to persist, temporarily, for 5 to 10 years, after which vegetation should reach a sufficient height to provide shaded riverine and riparian

habitat. However, the impacts to potential IWM recruitment to the channel are expected to linger over longer timescales. Because bank protection causes cessation of bank erosion and channel migration, the primary mechanisms for IWM recruitment in the future will be windthrow and tree mortality. Thus IWM recruitment from newly planted trees is not expected to occur until trees reach maturity and begin to senesce, 25 to 50 years or more after planting.

The impacts to the riparian forest in terms of future IWM recruitment will be significantly higher at sites that have restricted planting designations than those with unrestricted planting plans (See Appendix A for a list of unrestricted and restricted planting sites). Restricted planting sites will only be re-vegetated with shallow-rooted species too small to provide future IWM, including shrubs and/or small trees (including willows and white alder) depending on the thickness of soil above the levee design prism. In contrast, the unrestricted sites are planted with many larger species (e.g., Oregon ash, Western sycamore, Fremont cottonwood, and Valley oak) that have potential for becoming future IWM.

In the short-term, the loss of IWM recruitment from the riparian zone will be ameliorated by placement of anchored IWM at the MSWL along the waterside of the riparian benches. The effectiveness of planned installation of anchored IWM depends on the lifespan of the anchored IWM and residence time of any naturally recruited IWM. The buried IWM is expected to degrade and decrease over time due to fluvial abrasion caused by shear stress from flow, downriver transport of sediment and IWM, as well as organic decomposition. The expected lifespan and residence times of the IWM are largely unknown. IWM pieces that are continually submerged in water are expected to have decompose more slowly than pieces that are periodically exposed to air However, the submerged pieces will also have higher exposure to fluvial abrasion, and may not persist long enough to provide continuity in IWM availability, given the long timescales of forest maturation and senescense.

The benches are designed to capture IWM from upstream sites, but their effectiveness in this is currently unknown. Thus at the unrestricted planting sites there is likely to be an intermediate-term impact (estimated at 10 to 25 years post-project implementation) on IWM. At restricted planting sites there is expected to be both an intermediate- and longer-term IWM impact as once the buried IWM degenerates there will not be additional riparian supply. However, because the implementation of the proposed on-site mitigation measures are expected to provide significantly greater IWM benefits than under existing conditions or under the remaining alternatives, the longer-term degradation of IWM is considered less than significant.

The proposed erosion repairs will change the channel geometry at the erosion sites and alter the local hydraulics (i.e., flow velocity fields and water surface elevations). The erosion repairs call for placing additional revetment onto the waterside of the existing levees. This will build out the levee prism and reduce the channel cross-sectional area. The physical response to a reduction in cross-sectional area for a given discharge is for flow velocity to increase and/or water stage to increase for a given discharge. Both effects increase boundary shear stress, and in an alluvial river, the typical channel response would be lateral erosion and/or vertical incision to a new quasi-equilibrium channel that would transport the same amount of sediment at a given discharge as the original channel.

Because many of the proposed repair sites have limited opportunity for lateral migration of

the channel, due to extensive revetment in the vicinity of the sites, there is a chance that the channel will respond to the proposed action by vertical erosion. All proposed designs have been evaluated with a hydraulic model that computes steady state 2-dimensional flow analysis at five flow rates (i.e., the 2-, 10-, 25-, 50-, and 100-year events) for each bank protection site. Design specifications are modified based on model results in order to iterate to a design that minimizes changes in pre- and post-project implementation velocity fields and water surface elevations. The maximum allowable tolerance for change in water surface elevation for a 100-year flood event is a 0.1 feet difference between pre-and post project model scenarios. Velocity differentials between pre- and post-project scenarios are not allowed to exceed levels that would cause bank erosion (evaluated based on the composition of nearby banks). Designs are also evaluated and adjusted to limit bed scour.

Model results indicate some zones of velocity reduction, typically directly over the new bank protection or immediately downstream on the same bank. Velocity reductions, particularly at inner bend sites (e.g., Sac 53.5R and LAR 0.3L), may induce fine sediment deposition. Areas of maximum velocity increase and potential accelerated erosion vary with the channel planform position of the bank protection sites. Bank protection sites on inner bends tend to produce maximum velocity increases on the opposite, outer bank, where as straight reaches tend to increase velocity toward the channel centerline directly adjacent to the bank protection. Outer bend protection sites are shown by the model to have maximum velocity increases in close proximity to the new revetment, either immediately downstream or near the toe of the bank protection.

Model results predict that minimal erosion or additional flooding will occur from project implementation. It should be noted, however, that sediment transport and erosion processes are complex and numerical hydraulic models involve assumptions and associated levels of uncertainty. Hence, an increase in erosion cannot be eliminated as a potential impact. Localized erosion potential is likely higher along the deformable sand- dominated channel bed as compared to the channel banks that are armored with revetment or composed of cohesive silts and clays. Because hydraulic-related changes in erosion would likely be in the form of localized (i.e., not reach-wide) adjustments in gradient or channel width, the impacts associated with changes in local hydraulics and shear stresses are considered to be less than significant.

Site clearing, ground disturbance and grading, and placement of rock beneath the water line during construction would result in minor alterations to local drainage patterns in the vicinity of all erosion sites. Ground disturbing activities could increase the potential for localized erosion and sedimentation in the Sacramento River, Feather River, Lower American River, Cache Slough, and Steamboat Slough at the erosion sites. This could potentially increase local turbidity levels during construction activities in the short-term, but due to the extensive revegetation plans that include mixes of fast growing, native ruderal (i.e., weedy) species, these activities are not expected to produce chronic surface erosion areas or result in rill and gullying. Implementation of a SWPPP and associated BMPs are expected to reduce potential short-term impacts due to construction-related turbidity, suspended sediment, and sediment deposition to less than significant levels.

4.8.3.2 Alternative 2: Thin Rock Armor

This alternative would place a thin layer of rock over the existing, eroded levee slope. The result would protect the bank from erosion, but would not address slope stability issues. When placed on a slope of 2:1 (horizontal to vertical) or greater, the life span of this type of repair is estimated at approximately 25 years, half that of the preferred alternative.

This alternative would likely limit or altogether prevent implementation of on-site mitigation such as riparian plantings and IWM placement, which would cause a progressive decline in IWM loading due to the lack of potential IWM recruitment from the hillslope. The thin rock layer would continue to limit bank erosion, channel migration, and sediment and IWM recruitment. Relative to alternative 1, alternative 2 has a higher likelihood of causing channel erosion than the preferred alternative due to the steeper 2:1 profile of the new revetment that will protrude further out into the channel and be composed of coarser substrate than the existing bank profile. Additionally, the shorter lifespan of this alternative could lead to emergency levee repair work in the future that could be implemented with minimal hydraulic design consideration. Impacts due to potential emergency levee repairs are discussed below in Alternative 3.

4.8.3.3 Alternative 3: No Action

Under this alternative, no action would be taken to halt erosion and protect the levees at the 13 erosion sites. As such, the banks would continue to erode, increasing the risk of levee failure and subsequent flooding in the surrounding areas. This erosion would continue to worsen through wave wash, flood flows, and human disturbance. Eventually, emergency repair measures would need to be implemented to protect the levee system from failing. Levee repairs under these circumstances would likely involve bare rock revetment being placed without the advantages of contouring riparian benches with IWM embedded in the rock, minimal protection and re-seeding of the riparian forest, and rock being placed without the advantages of hydraulic modeling to design and guide in the installation in a manner that minimizes velocity and water surface elevation differentials between pre- and post-project scenarios. Thus impacts associated with the no-action alternative would include:

- cessation of bank erosion;
- elimination of IWM stored at the site;
- changes in the riparian forest that would likely eliminate hillslope IWM recruitment in the short and long-term;
- and a much higher likelihood than the preferred alternative of erosion of the channel bed and banks due to changes in velocity.

4.8.4 Mitigation

In the short-term, the loss of IWM recruitment from the riparian zone will be ameliorated by the anchoring of IWM under rock revetment at the toe of the riparian bench for higher water winter and spring habitat and in the toe of the levee at the mean low flow water surface elevation for summer and fall habitat. In fact, at the majority of the sites the short-term IWM loading levels will increase significantly from current levels (Table 4-10) as 40% of the shoreline will be covered with IWM under the planned designs. Erosion sites at Sac 16.8L,

CS 21.8R; and SB 16.6R will not be constructed with additional IWM due to aquatic habitat concerns, but IWM will be mitigated for at these sites by placing additional IWM at other sites. The elevated IWM loads will also likely increase the local trap efficiency of IWM that is fluvially transported downriver, and may increase the IWM loading beyond the 40% shoreline coverage in the current designed. In large part, the success of this mitigation depends on the lifespan and residence time of the IWM placed during project implementation, which is a primary unknown. In order to gauge the success of the IWM mitigation, monitoring of the IWM loading at each site is included in post-construction monitoring. Continued monitoring of IWM loads will provide data to assess whether additional IWM placement and mitigation is necessary in the future.

By decreasing the cross-sectional area and thus causing local velocities to increase, the proposed repair work may cause localized channel scour or bank instability in adjacent areas where revetment and/or levees have weakened over time. Channel cross-sectional monitoring is recommended in the vicinity of a limited population of the bank protection sites in order to assess potential scour, as well as inform future repair projects.

4.9 Air Quality

4.9.1 Environmental Setting

Construction at the thirteen erosion sites would occur within the Sacramento Valley Air Basin. The air basin is bounded by the Coast Ranges to the west and the Sierra Nevada to the east. The Carquinez Strait, a sea-level gap in the Coast Ranges, is located 50 miles southwest of Sacramento, and the intervening terrain is very flat. The prevailing wind direction in the Sacramento Valley is southwesterly, resulting from marine breezes through the Carquinez Strait. During winter, when the sea breeze diminishes, northerly winds occur more frequently, but southerly winds still predominate.

A relatively stable high pressure weather system positioned off the coast diverts storms to the north, away from California, during the spring, summer, and early fall. The dry, warm, subsiding air of this system produces an atmospheric condition known as a subsidence inversion, where warm air overlies cooler air. Subsidence inversions may be several thousand feet deep and, together with strong sunlight, can produce worst-case conditions for smog, of which ozone (O_3) is the largest single component. In conjunction with this high-pressure zone, a thermal trough (a low-pressure zone caused by intense surface heating) is normally positioned over the Central Valley. The relative positions of these pressure zones serve to increase the movement of cooler ocean air through the Carquinez Strait to the Sacramento Valley. This helps cool the region, but it also carries pollutants from upwind, urban sources.

During the late fall, winter, and early spring, the position of the summertime high-pressure zone shifts to the south, allowing numerous storm fronts to sweep through the region. Typically, over 30 of these winter storms can be expected per year, accounting for virtually all of the precipitation the city of Sacramento receives in a typical year (about 18 inches in an average year). Periods of stagnation between storms are characterized by very light winds. Surface inversions, which can form under these conditions, are most often observed in the morning from October to February.

Existing conditions for air quality in the project area can be described with summary statistics for critical air pollutants. Typical pollutants include O_3, carbon monoxide (CO), and coarse particles: 2.5 micrometers (µm) to 10 µm in size (PM_{10}). Air quality data for the Sacramento Valley Air Basin from 2004 to 2006 are summarized (Table 4-11).

Table 4-11 Summary Statistics for Air Quality Data in the Sacramento Valley Air Basin

Year	Pollutant (Averaging Time)	Maximum Concentration	Number of Days Exceeding Federal Standards	Number of Days Exceeding State Standards
2004	O_3 (1h)	0.13 ppm	1	29
2004	O_3 (8h)	0.10 ppm	20	N/A
2004	CO (8h)	4.05 ppm	0	0
2004	PM_{10} (daily)	171 ug/m^3	1	13
2005	O_3 (1h)	0.13 ppm	3	33
2005	O_3 (8h)	0.12 ppm	25	N/A
2005	CO (8h)	4.19 ppm	0	0
2005	PM_{10} (daily)	110 ug/m^3	0	25
2006	O_3 (1h)	0.14 ppm	7	44
2006	O_3 (8h)	0.11 ppm	39	N/A
2006	CO (8h)	4.19 ppm	0	0
2006	PM_{10} (daily)	160 ug/m^3	1	11

N/A = not applicable; state standards for ozone are based on 1h averaging time only. Source: CARB (2006).

The Sacramento Valley Air Basin does not consistently meet several applicable state air quality standards (CARB 1996). Depending on the pollutant, the boundaries of the attainment areas vary. Between 2004 and 2006, measures of ozone frequently exceeded both federal and state standards, whereas concentrations of PM_{10} rarely exceeded federal standards (Table 4-11). PM_{10} concentrations did, however, frequently exceed state standards. Concentrations of CO did not exceed state or federal standards during 2004 to 2006.

The Sacramento Valley Air Basin, including all of Butte, Colusa, Glenn, Sacramento, Shasta, Sutter, Tehama, Yolo, Yuba and portions of Placer, and Solano counties, is designated as a non-attainment area for the federal and state ozone standards. Sacramento, Sutter, Solano, Yolo, and Glenn counties have varying classifications of non-attainment. Sacramento County is designated as a serious non-attainment area according to federal and state ozone standards; Solano County classification is severe based on both federal and state standards. Sutter County classifications vary, depending on location, ranging from moderate (Sutter

Buttes) to serious (South Sutter) according to state standards, and from no specific classification (Sierra Buttes) to serious (South Sutter) according to federal standards; Yolo County classification is severe based on federal standards and serious based on state standards. Glenn County is unclassified with regards to federal standards, but classified as non-attainment/transitional according to state standards. For CO, the Sacramento urbanized area was reclassified from non-attainment to attainment of the federal and state standards in 1998; therefore, the project area is considered to be a maintenance area for CO. For the federal PM_{10} standards, only Sacramento County has been designated a non-attainment area; however, redesignation to attainment has been requested by the Sacramento Metropolitan Air Quality Management District (SMAQMD). For the state PM_{10} standards, the entire air basin is considered a non-attainment area.

4.9.2 Regulatory Setting

4.9.2.1 Federal and State Laws and Regulations

Air quality in the air basin is regulated by federal, state, and regional agencies. At the federal level, the USEPA is responsible for overseeing implementation of the 1990 federal Clean Air Act (42 U.S.C. 7401 et seq.). The Air Resources Board is the state agency that regulates mobile sources and oversees implementation of state air quality laws, including the 1988 California Clean Air Act (Health & Safety §§ 42300 et seq).

Pursuant to the federal Clean Air Act, the USEPA has established national ambient air quality standards for criteria pollutants, including O_3, CO, $PM_{10,}$ and particulate matter of respirable size ($PM_{2.5}$). California's ambient air quality standards are generally more stringent than the federal standards. The federal and state standards for O_3, CO, and PM_{10} are summarized (Table 4-12).

Table 4-12 Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1]	Federal Standards[2]	
			Primary[3]	Secondary[4]
O_3	8 hour 1 hour	-- 0.09 ppm	0.08 ppm 0.12 ppm	0.08 ppm 0.12 ppm
CO	8 hour 1 hour	9.0 ppm 20 ppm	9 ppm 35 ppm	-- --
PM_{10}	Annual geometric mean Annual arithmetic mean 24 hour	30 ug/m^3 -- 50 ug/m^3	-- 50 ug/m^3 150 ug/m^3	-- 50 ug/m^3 150 ug/m^3
$PM_{2.5}$	Annual arithmetic mean 24 hour	-- --	15 ug/m^3 65 ug/m^3	15 ug/m^3 65 ug/m^3

[1]California standards for O_3, CO, and PM_{10} are values that are not to be exceeded.

[2]National standards, other than ozone and those based on annual averages or annual arithmetic mean, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per

calendar year with maximum hourly average concentrations above the standard is equal to or less than one.

[3]National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

[4]National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

ppm = parts per million; ug/m^3 = micrograms/per cubic meter.

Source: CARB (2003).

4.9.2.2 Local Laws and Regulations

The primary agency that regulates air quality in the area of the erosion sites on a regional level is the SMAQMD. Regional planning and attainment of air quality goals also involve the local air quality agencies of Feather River Air Quality Management District (FRAQMD), Glenn County Air Pollution Control District (GCAPCD) and Yolo-Solano Air Quality Management District (YSAQMD), in addition to the neighboring local air quality agencies of El Dorado County Air Pollution Control District and Placer County Air Pollution Control District. SMAQMD and these local agencies have permit authority over stationary sources, act as the primary reviewing agencies for environmental documents, and develop regulations that must be consistent with, or more stringent than, federal and state air quality policies.

4.9.3 Environmental Effects

The project would have a significant adverse effect on air quality if it would:

- Violate applicable air quality standards (Table 4-12);
- Contribute substantially to an existing or projected air quality violation; or
- Expose sensitive receptors to substantial pollutant concentrations.

4.9.3.1 Alternative 1: Proposed Action

This section describes the potential air quality effects of the Proposed Action, including exhaust emissions from construction equipment and worker commute and delivery vehicles, fugitive dust generated by construction activities, and vehicle travel over unpaved roads. To complete the analysis, information was collected on projected construction activities, duration, and timing; equipment use and activities for each construction year.

Emissions associated with vehicle exhaust for employee commute vehicles and delivery trucks were estimated using SMAQMD Road Construction Emission Model Version 5.2, with the Motor Vehicle Emission Factor/Emission Inventory Model emission factors (CARB 2002), the latest version of this California Air Resources Board model (SMAQMD 2006a) (Appendix L). These emissions were based on assumptions described in

Table 4-13. Emissions associated with the operation of construction equipment were estimated using the SMAQMD's "Guide to Air Quality Assessment in Sacramento County" (SMAQMD 2004). Construction equipment usage from similar projects under the SRBPP was used to estimate daily and annual exhaust emissions for construction equipment.

Table 4-13 Emission Sources and Assumptions Used to Determine Air Emissions

Emission Source	Bank Erosion Sites
Material placed	58,600 cubic yards of revetment, sand, soil by barge 123,900 cubic yards of revetment, sand, soil by truck
Employee commute trips	5 employee trips/day, 20 miles each way (per site)
Delivery truck trips/ Debris haul truck trips (Landside construction[1])	7 trips per day for Site RM 0.3L, 11 trips per day for Site RM 2.8L, 9 trips per day for Site RM 53.5R, 9 trips per day for Site RM 177.8R, 11 trips per day for Site RM 16.8L, 5 trips per day for Site RM 42.7R, 15 trips per day for Site RM 55.2L, 10 trips per day for Site RM 77.2L, and 21 trips per day for Site RM 28.5R Average round trip for trucks: 70 miles 20 cubic yards average load for trucks 64 hauling days
Fuel-fired construction equipment (Waterside construction[2])	Chain saws (2) Cranes (2) Generators (3) Excavator (1) Winches (4) Motor Boats (2) Pick Up trucks (2) Light plants (2) Air compressor (1) Tug Boats (1)

Emission Source	Bank Erosion Sites
Fuel-fired construction equipment (Landside construction[1])	Chain saws (2) Crane (1) Generators (2) Excavator (1) Dump trucks (5) Winches (2) Pick Up trucks (2) Light plants (2) Front end loader (1) Crawler tractor (1)

[1] Landside construction will occur at all sites in contracts 2 and 3 (LAR 0.3L, LAR 2.8L, Sac 53.5R, Sac 177.8R, Sac 16.8L,Sac 42.7R, Sac55.2L, Sac 77.2L, and F 28.5R); construction for contract 2 will occur in 2008, and construction for contract 3 will occur in 2009.

[2] Waterside construction will occur at all sites in contract 1 (SB 16.6R, CS 21.8R, Sac 49.7L, and Sac 52.3L) during 2008.

Fugitive dust emissions from vehicle travel over unpaved roads and construction activities were estimated using data and emission factors from SMAQMD Road Construction Emission Model Version 5.2 and its emission factors (CARB 2002), and the latest version of the California Air Resources Board model (SMAQMD 2006a).

The model simulation input data and assumptions regarding construction activities used to estimate construction emissions are summarized (

Table 4-13). The projected cubic yards of material to be imported, the projected number of employee commute trips, the anticipated number of delivery and haul truck trips, and the construction equipment projected to be used are listed (

Table 4-13).

Emissions thresholds developed by the SMAQMD, YSAQMD, FRAQMD, GCAPCD, and the USEPA were used in determining the significance of project-related air quality effects. Emissions would be considered significant if emissions exceeded the local thresholds established by these agencies for construction activities.

These thresholds were established to assist in CEQA analyses within the SMAQMD boundaries (SMAQMD 2004):

- 85 pounds per day of Nitrogen Oxides (NO_X)
- 85 pounds per day of Reactive Organic Gas (ROG)

- 275 pounds per day of PM_{10}

Thresholds established by the YSAQMD were (YSAQMD 2002):

- 82 pounds per day of NO_X
- 82 pounds per day of ROG
- 150 pounds per day of PM_{10}

Thresholds established by the FRAQMD (FRAQMD 1998) were:

- 25 pounds per day of NO_X
- 25 pounds per day of ROG
- 80 pounds per day of PM_{10}

Thresholds established by the GCAPCD (Kevin Tokunaga, GCAPCD, pers. comm., 2008) were:

- 25 pounds per day of NO_X
- 25 pounds per day of ROG
- 80 pounds per day of PM_{10}

Emissions for the project would be considered significant under NEPA if annual emissions exceeded USEPA's general conformity thresholds. Conformity thresholds are based on the *de minimis* thresholds included in the USEPA's general conformity guidelines for air pollutants in non-attainment areas (40 FR 51.853), as applicable for the Sacramento area. The thresholds are:

- 25 tons per year of NO_X (SB 16.6R, CS21.8R, Sac 42.7R, and Sac 53.5R)
- 25 tons per year of ROG (SB 16.6R, CS 21.8R, Sac 42.7R, and Sac 53.5R)
- 50 tons per year of NO_X (LAR 0.3L, LAR 2.8L, Sac 16.8L, Sac 49.7L, Sac 52.3L, Sac 55.2L, Sac 77.2L)
- 50 tons per year of ROG (LAR 0.3L, LAR 2.8L, Sac 16.8L, Sac 49.7L, Sac 52.3L, Sac 55.2L, Sac 77.2L)
- 100 tons per year of NO_X (F 28.5R)
- 100 tons per year of ROG (F28.5R)
- 100 tons per year of PM_{10} (LAR 0.3L, LAR 2.8L, Sac 16.8L, Sac 49.7L, Sac 52.3L, Sac 55.2L, Sac 77.2L)
- 100 tons per year of CO (Sac 177.8R)

Potential air pollutants generated during construction include PM_{10} emissions from debris-moving activities and vehicle travel on unpaved roads, and exhaust emissions from operation of construction equipment, delivery and haul trucks, and employee vehicles. Tailpipe exhaust emissions include ozone precursors (NO_X and ROG) and PM_{10}. The air quality estimates are based on waterside construction equipment emissions (barges and boats) for sites SB 16.6R, CS 21.8R, Sac 49.7L, and Sac 52.3L, and landside emissions (trucks) for sites LAR 0.3L, LAR 2.8L, Sac 53.5R, Sac 177.8R, Sac 16.8L, Sac 42.7R, Sac 55.2L, Sac 77.2L, and F 28.5R (

Table 4-13).

The maximum daily emissions in pounds per day (lb/day) for construction of sites under the Proposed Action were estimated (Table 4-14). In addition, the average annual emissions in tons per year (ton/yr) for the construction period were also estimated (Table 4-15).

Table 4-14 Maximum Daily Construction Emission Estimates (pounds per day)

Project Component	NO_x	ROG	PM_{10}	CO	Air Quality District
*RM 28.5R	127	21	11	102	FRAQMD
Threshold	*25*	*25*	*80*[1]	*N/A*	*FRAQMD*
RM 177.8R	108	19	11	85	GCAPCD[2]
Threshold	*25*	*25*	*80*	*N/A*	*GCAPCD*[2]
RM 49.7L	139	18	12	110	SMAQMD
RM 52.3L	139	18	12	110	SMAQMD
RM 0.3L	103	18	11	80	SMAQMD
RM 2.8L	114	19	11	89	SMAQMD
*RM 16.8L	114	19	11	89	SMAQMD
*RM 55.2L	124	20	11	98	SMAQMD
*RM 77.2L	111	19	11	87	SMAQMD
Threshold	*85*	*85*	*275*[1]	*N/A*	*SMAQMD*
RM 16.6R	139	18	12	110	YSAQMD
RM 21.8R	139	18	12	110	YSAQMD
RM 53.5R	108	19	11	85	YSAQMD
*RM 42.7R	98	18	11	76	YSAQMD
Threshold	*82*	*82*	*150*[1]	*N/A*	*YSAQMD*

*Construction begins in Fall 2009; all other sites to begin construction in Fall 2008.

N/A - not applicable, California Ambient Air Quality Standards not based upon emission rate, but require no increase in ambient CO concentrations by 5% or more.

[1]The current threshold for PM10 is set at 50 ug/m3 averaged over a 24-h period.

[2]Glenn County Air Pollution Control District

Table 4-15 Average Annual Construction Emission Estimates (tons per year)

Project Component	July 1 to November 30			
	NO_x	ROG	PM_{10}	CO
*RM 28.5R	3	<1	<1	3
Threshold	100	100	N/A	N/A
RM 177.8R	3	<1	<1	2
Threshold	N/A	N/A	N/A	N/A
RM 49.7L	2	<1	<1	2
RM 52.3L	2	<1	<1	2
RM 0.3L	2	<1	<1	2
RM 2.8L	3	<1	<1	2
*RM 16.8L	3	<1	<1	2
*RM 55.2L	3	<1	<1	2
*RM 77.2L	3	<1	<1	2
Threshold	50	50	100	100
RM 16.6R	2	<1	<1	2
RM 21.8R	2	<1	<1	2
RM 53.5R	3	<1	<1	2
*RM 42.7R	2	<1	<1	2
Threshold	25	25	N/A	N/A

* - Construction begins in Fall 2009; all other sites to begin construction in Fall 2008.

N/A - not applicable, due to being unclassified for all criteria pollutants based on federal standards (Glenn County, Site RM 177.8R); or unclassified for PM10 (Solano County, Sites RM 16.6R, 21.8R; Yolo County, Sites RM 53.5R, and 42.7R).

Based on this analysis, construction of the proposed project would result in the temporary increase in emissions of ROG, CO, NO_x, and PM_{10}. Estimated daily emissions of NO_x (Table 4-14) would exceed thresholds established by SMAQMD, YSAQMD, FRAQMD, and GCAPCD under the Proposed Action. Estimated daily emissions of ROG would not exceed thresholds established by these agencies, because several of the sites (CS 28.5R, Sac 16.8L, Sac 42.7R, Sac 55.2L, and Sac 77.2L) will begin to be constructed in Fall 2009 rather than Fall 2008. For PM_{10}, the SMAQMD and other Air Districts revised their CEQA thresholds

from a pound-per-day threshold to a concentration-based threshold in 2002. The current threshold for PM_{10} is set at 50 ug/m^3 averaged over a 24-hour period.

Under NEPA, federal conformity for NO_x, ROG, PM_{10}, and CO would not be exceeded, based on annual thresholds (Table 4-15). The proposed mitigation measure below would reduce this impact to a less-than-significant level.

The Proposed Action is not expected to create objectionable odors that would affect a large number of people or expose sensitive receptors to substantial pollutant concentrations. Sensitive receptors are located within the project area, primarily individual residences within ¼ mile of all sites except SB 21.8R and several schools and child care facilities within one mile of the erosion sites (Table 4-16). However, changes in air quality would occur only during the construction period and over a short period of time.

Although the project is adjacent to several urban areas, it is not expected to create objectionable odors because diesel exhaust would be readily dispersed. Due to the short-term duration of this project and the dispersive nature of diesel emissions (Zhu et al. 2002), the impact on sensitive receptors is deemed less than significant. Therefore the project would result in a less than significant impact on air quality associated with increasing objectionable odors or substantially increasing pollutant concentrations. No mitigation is required.

Table 4-16 Sensitive Receptors within 1 mile of each erosion site

Erosion Site	Sensitive Receptors[1]
SB16.6R	• 1–2 individual residences within ¼ mile of site.
CS 21.8R	• None.
Sac 49.7L	• Merryhill School: Sacramento is 1,800 feet north of site, • Matsuyama Elementary School is 2,500 feet east of site, and • Many individual residences within ¼ mile of site.
Sac 52.3L	• Kovars Satori Academy is 1,700 feet south of site, • Genevieve F Didion K-8 School is 1,700 feet southwest of site, • One 4th R School Age Child Care is 1,700 feet southwest of site, • Another 4th R School Age Child Care is 5,500 feet southeast of site, • Angel's Nest Preschool is 3,700 feet south of site, • John F. Kennedy High School is 4,500 feet south of site, • Bear Flag Elementary School and Bear Flag Preschool are 5,500 feet southeast of site, and • Many individual residences within ¼ mile of site.

Erosion Site	Sensitive Receptors[1]
LAR 0.3L	• Northeast California University School of Law is 3,700 feet northwest of site and • 1–2 individual residences within ¼ mile of site.
LAR 2.8L	• Courtyard Private School is 1,800 feet south of site and • 1–2 individual residences within ¼ mile of site.
Sac 53.5R	• Land Park Academy - Riverside is 500 feet south of site, • Sierra Nueva School is 1,400 feet north of site, • John Cabrillo Elementary School, John Cabrillo Child Care, and 4th R School Age Child Care are 2,600 feet northeast of site, • Sam Brannan Middle School is 3,400 feet northeast of site, • Landpark Infant Center and Preschool is 3,400 feet northeast of site, • Little Blossom Montessori School is 3,500 feet east of site, • Bear Flag Elementary School and Bear Flag Preschool are 4,300 feet south of site, • Alice Birney Elementary School is 5,100 feet southeast of site, and • Several individual residences in within ¼ mile of site.
Sac 177.8R	• River Valley Christian School is 6,050 feet northwest of site and • 2–3 individual residences within ¼ mile of site.
Sac 16.8L	• Isleton Elementary School is located 2,250 feet southeast of site, • River Delta Unified School District: Consolidate Programs is 4,000 feet east of site, and • Many individual residences within ¼ mile of site.
Sac 42.7R	• Clarksburg Middle School and Delta High School are 2,450 feet south of site, and • Several individual residences within ¼ mile of site.

Erosion Site	Sensitive Receptors[1]
Sac 55.2L	• Landpark Infant Center & Preschool is 1,650 feet south of site, • Sam Brannan Middle School is 2,350 feet south of site, • Sierra Nueva School is 2,900 feet southwest of site, • John Cabrillo Elementary School, John Cabrillo Child Care, and 4th R School Age Child Care are 3,200 feet south of site, • Park Vista School is 4,690 feet northeast of site, • The Sacramento Zoo is 5,250 feet northeast of site, and • Many individual residences within ¼ mile of site.
Sac 77.2L	• Several individual residences within ¼ mile of site.
F 28.5R	• Special Education School is 250 feet west of site, • Yuba City Kuk Sool Won is 700 feet west of site, • Bridge Street Elementary School is 2,600 feet west of site, • Covillaud Elementary School is 4,000 feet east of site, • Twin Rivers Charter School is 4,700 feet west of site, • Yuba County Special Education is 4,800 feet northeast of site • Park Avenue Elementary School and Yuba City High School are 5,450 feet southwest of site, and • Many individual residences within ¼ mile of site.

[1]All distances are approximate to within 50 feet.

4.9.3.2 Alternative 2: Thin Rock Armor

The effects of the thin rock armor alternative would likely be greater than the proposed action due to likely failure of the thin riprap. When the riprap fails, there would be a need to haul more rock. Emissions during the initial rock hauling would be comparable to the proposed action, because emissions are primarily related to the movement of larger materials (e.g., quarry stone) that would also be substantial for the alternative. The additional emissions that would occur during hauling to address riprap failure would make this alternative more intensive than the proposed action in terms of overall emissions.

4.9.3.3 Alternative 3: No Action

The No Action alternative would likely result in a continuation of the current air quality standard violations, similar to the trend shown in Table 4-11.

4.9.4 Mitigation

Standard construction practices at the erosion sites would ensure that exhaust emissions from

all off-road diesel-powered equipment used on the sites do not exceed 40 % opacity for more than 3 minutes in any 1 hour. Any equipment found to exceed 40 % opacity (or Ringelmann 2.0) would be repaired immediately, and USACE and the appropriate local air quality agency would be notified within 48 hours of identification of non-compliant equipment. A visual survey of all in-operation equipment would be made at least weekly, and a monthly summary of the visual survey results would be submitted throughout the duration of the project, except that the monthly summary would not be required for any 30-day period in which there is no construction activity. The monthly summary would include the quantity and type of vehicles surveyed, as well as the dates of each survey. The SMAQMD and/or other officials may conduct periodic site inspections to determine compliance. Nothing in this Section would supersede SMAQMD, YSAQMD, FRAQMD, GCAPCD, or State rules or regulations.

Additional BMPs would be implemented for O_3 and PM_{10} to help protect ambient air quality conditions. To reduce O_3 and PM_{10} levels, the contractor would perform routine tuning and maintenance of construction equipment to ensure that the equipment is in proper running order. The contractor would also monitor dust conditions along access roads and within the construction area to ensure that the generation of fugitive dust is minimized below the 50 ug/m^3 24-hour threshold. Water sprays would be periodically applied to disturbed areas and soil stockpiles for dust control, at least three times per day during hot weather. Minimum freeboard for all haul vehicles shall be 2-feet or greater. Lastly, soil-disturbing activities would be suspended during periods with winds over 25 miles per hour.

For NO_x, significant air quality effects have been identified, and the USACE would implement the mitigation measures at the end of this Section to reduce emissions in years where SMAQMD, YSAQMD, FRAQMD, or GCAPCD thresholds are exceeded.

The project applicant or representative shall provide a plan for approval by SMAQMD (Sac 49.7L, Sac 52.3L, LAR 0.3L, LAR 2.8L, Sac 16.8L, Sac 55.2L, and Sac 77.2L), YSAQMD (SB 16.6R, CS 21.8R, Sac 53.5R, and Sac 42.7R), FRAQMD (F 28.5R), GCAPCD (Sac 177.8R), the CVFPB, and the USACE demonstrating that the erosion sites will not exceed 85 lbs/day of NO_x (Sac 49.7L, Sac 52.3L, LAR 0.3L, LAR 2.8L, Sac 16.8L, Sac 55.2L, and Sac 77.2L), 82 lbs/day of NO_x (SB 16.6R, CS21.8R, Sac 53.5R, and Sac 42.7R), 25 lbs/day of NO_x (F 28.5R), and 25 lbs/day of NO_x (Sac 177.8R). The plan shall demonstrate that heavy-duty (> 50 horsepower) off-road vehicles to be used in the construction project, including owned, leased and subcontractor vehicles, will achieve a project-wide fleet-average 20 percent NO_x reduction and 45 percent particulate reduction compared to the most recent CARB fleet average at time of construction. To reduce NO_x emissions for this project, the applicant may employ one or more of the following measures:

- Require injection timing retard of 2 degrees on all diesel vehicles, where applicable.
- Install high pressure injectors on all vehicles, where feasible.
- Encourage the use of reformulated diesel fuel.
- Electrify equipment, where feasible.
- Maintain equipment in tune with manufacturer's specifications.
- Install catalytic converters on gasoline-powered equipment.
- Substitute gasoline-powered for diesel-powered equipment where feasible.

- Use compressed natural gas or on-site propane mobile equipment instead of diesel powered equipment, where feasible.

The contractor shall submit to the lead agency, and all relevant air quality management districts, a comprehensive inventory of all off-road construction equipment, equal to or greater than 50 horsepower, that will be used an aggregate of 40 or more hours during any portion of the construction project. The inventory shall include the horsepower rating, engine production year, and projected hours of use or fuel throughput for each piece of equipment. The inventory shall be updated and submitted monthly throughout the duration of the project, except that an inventory shall not be required for any 30-day period in which no construction activity occurs. At least 48 hours prior to the use of subject heavy-duty off-road equipment, the contractor shall provide the relevant air quality management districts with the anticipated construction timeline including start date, and name and phone number of the project manager and on-site foreman.

In addition, the USACE and CVFPB shall pay the appropriate local air quality agency an off-site mitigation fee based on the incremental significant emissions at a rate of $14,300/ton (or other negotiated amount) of NO_x, and that the fee would be paid to the agency prior to beginning construction. This mitigation fee would be used as off-site mitigation within the air basin to mitigate NO_x from other ongoing construction projects. Using the latest version of the Mitigation Fees Calculator (revised September 2006, SMAQMD 2006b), which assumes 20% reduction in NO_x due to the proposed mitigation plan, payments that would be due to SMAQMD were estimated. Calculations used in the Mitigation Fees calculator were also applied to district-specific thresholds to obtain potential fees due to the other air quality or air pollution control districts involved. YSAQMD is the only district in the project area that does not require mitigation fees. The payment is calculated to be $191,970 to SMAQMD for exceedance of 13.4 tons during construction, assuming construction at erosion sites Sac 49.7L, Sac 52.3L, LAR 0.3L, LAR 2.8L, Sac 16.8L, Sac 55.2L, and Sac 77.2L; $35,230 to FRAQMD for exceedance of 2.5 tons during the construction at the erosion site F 28.5R; and $28,220 to GCAPCD for exceedance of 2.0 tons during the construction at the erosion site Sac 177.8R. Exceedance within the SMAQMD may be reduced if sites are built sequentially rather than simultaneously. At this point, it is difficult to verify the fee estimates above because the specific number of days that each piece of equipment will be used is not yet known, nor is the specific length of the construction period. Final emissions estimates and fees will be developed by the contractor.

With the implementation of the mitigation measures described above, the proposed project would not exceed SMAQMD, YSAQMD, FRAQMD, or GCAPCD thresholds, and federal Thresholds of Significance. As a result, potential emissions due to the project would be below the level of significance for air quality.

4.10 Traffic

The traffic impacts associated with repair of the 13 erosion sites will be limited to the construction phase of the project, as there will not be any permanent changes to roadways in the area of the sites, and the repairs will not be associated with any operational traffic. This analysis describes the potential haul routes that would be used to transport construction materials and the potential for project related traffic to exceed the capacity of these

thoroughfares.

4.10.1 Environmental Setting

The area road system generally consists of rural two lane roadways, the capacity of which is governed by such varying factors as alignment, shoulder and travel way width, passing sight distance and the percentage of trucks and/or recreational vehicles using the routes. Because area roads carry a significant amount of recreational traffic during summer months, traffic volumes and operating Levels of Service (LOS) vary throughout the year.

Major roadways can be used to access the erosion sites from either the north of the south. Table 4-17 identifies the most likely roadways used for material hauling.

Table 4-17 Anticipated Haul Routes

Erosion Site	Primary Roads Used for Site Access from the North	Primary Roads Used for Site Access from the South
SB 16.6R	I-5 to Hwy 220	I-5 to Hwy 220
CS 21.8R	I-80 to Hwy 113	Hwy 12 to Hwy 113
Sac 49.7L	I-5	I-5
Sac 52.3L	I-5	I-5
LAR 0.3L	I-80 to I-5	I-5
LAR 2.8L	I-80 to I-5	I-5
Sac 53.5R	I-80 to U.S. Hwy 50 to Hwy 84	I-5 to U.S. Hwy 50 to Hwy 84
Sac 177.8R	Hwy 45	Hwy 45
Sac 16.8L	Hwy 5 to Hwy 160	Hwy 4 to Hwy 160
Sac 42.7R	I-80 to U.S. Hwy 50 to Hwy 84	I-5 to Hwy 160
Sac 55.2 L	I-5	I-5
Sac 77.2L	Hwy 99	Hwy 99
F 28.5R	Hwy 99 to Hwy 20	Hwy 99

4.10.2 Regulatory Setting

4.10.2.1 Federal and State Laws and Regulations

California Public Utilities Code

Division 10 of the Public Utilities Code creates transit districts, the board of directors of which has authority over transportation funding and project prioritization decisions.

4.10.2.2 Local Laws and Regulations

Local regulations with regard to transportation are primarily focused on the potential for new development to impact the existing system. The levee repairs are not considered, for the purposes of this document, to be new development, but rather repairs to existing infrastructure.

Glenn County General Plan

The Glenn County General Plan Policies CDP-54 and CDP-57 are designed to ensure that roadways are adequate to accommodate the traffic levels they serve, that potential impacts of proposed development projects are determined, and that the established LOS is maintained.

Sacramento County General Plan

The Circulation Element of the Sacramento County General Plan identifies all state and national highways within the county as truck routes, per the California DOT, as part of the Service Transportation Assistance Act (STAA).

No work will be conducted within the right-of-way of any Sacramento County Roads.

Solano County General Plan

The Transportation and Circulation Element of the Administrative Draft of the Solano County General Plan establishes policies that Maintain and improve roadways, as well as designate and reserve adequate right-of-way to meet projected traffic volumes (Solano County 2007).

Solano County Code

Under Title 15 of the Solano County Code, the Public Works Department has created the *Book of Official Traffic Regulation Codes*, which establishes vehicle speed, weight, and size limits on county roads (Solano County 2007).

Yolo County General Plan

The Circulation Policies of the Yolo County General Plan address issues concerning the design and construction of the proposed levee repairs. The General Plan states that the county and applicable Reclamation Districts will develop agreements to establish and maintain hiking, biking and horse trails on levees and other right-of-ways, and provisions for ensuring the safety of the public and the security of the adjoining land owners and users. Furthermore, Circulation Policy 17 discourages truck traffic on residential streets. The Yolo County site, Sac 42.7R, can be accessed without travel on residential roads.

4.10.3 Environmental Effects

Construction access will be determined based upon the contractor and the location of each erosion site. The rock revetment materials may be transported by either barge or truck. Truck traffic that would result from landside construction may temporarily impact roads in the vicinity of the erosion sites.

Effects to traffic and transportation as a result of implementing the proposed erosion repairs were found to be significant if the project would:

- Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system;

- Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads and highways;
- Result in a change in traffic patterns, including either an increase in traffic levels or a change in location, that results in substantial safety risks; or
- Result in inadequate parking capacity.

4.10.3.1 Alternative 1: Proposed Action

This alternative would include the placement of rock revetment on the eroding slope of the levee. In the case of landside construction, this would involve the steady transport of large loads of quarry rock for a significant portion of the construction timeframe. These trips would take place during business hours of 6:00 a.m. to 5:00 p.m. However, most trips would occur during off-peak traffic hours, from 9:00 a.m. to 4:00 p.m. Waterside construction would eliminate the haul traffic to the site. Barge access to the sites and coordination with the drawbridge authority shall be the responsibility of the contractor. In either case, however, the repair process will generate construction related traffic (workers arriving onsite) that exceeds the current draw of people to these locations.

Temporary changes in traffic patterns may be required on those sites adjacent to state and county roadways. Following project completion, the sites will not generate any traffic and no parking will be necessary to serve the repair sites. Temporary construction related traffic would be a significant impact of erosion repairs.

4.10.3.2 Alternative 2: Thin Rock Armor

This alternative would include the placement of rock revetment on the eroding slope of the levee as in Alternative 1; however, this alternative would require a smaller quantity of rock. Landside construction would involve the steady transport of large loads of quarry rock for a significant portion of the construction timeframe. These trips would take place during business hours of 6:00 a.m. to 5:00 p.m. However, most trips would occur during off-peak traffic hours, from 9:00 a.m. to 4:00 p.m. Waterside construction would eliminate the haul traffic to the site. In either case, however, the repair process will generate construction related traffic (workers arriving onsite) that exceeds the current draw of people to these locations.

Temporary changes in traffic patterns may be required on those sites adjacent to state and county roadways. Contractors would employ traffic control measures as necessary to ensure the public's safety. Construction impacts would not cause a significant increase in traffic, nor would they exceed existing LOS standards. A staging area has been established at each site for the purpose of construction related parking. Following project completion, the sites will not generate traffic and no parking will be necessary to serve the repair sites. Temporary construction related traffic would be a significant impact of erosion repairs.

4.10.3.3 Alternative 3: No Action

Under this alternative, no action would be taken to halt erosion at the erosion sites. Increased road usage would not occur. This alternative does not ameliorate the potential for levee failure, the result of which could be extensive road closures and severe impacts to traffic.

4.10.4 Mitigation

Construction vehicles that meet the STAA definition of heavy freight vehicles, as found in the California State Vehicle Code, would be required to follow established truck routes to the greatest extent possible. These routes have been designed to minimize the problems caused by trucks that are oversized, overweight, or too tall for specific roads and to reduce potential hazards to pedestrians and bicyclists.

The construction contractor shall prepare a traffic management plan to be implemented during construction and monitored by the USACE. The contractor shall verify that all roads, bridges, culverts, and other infrastructure along the access routes can support haul vehicle loads. The plan would be approved by the pertinent counties and the California Department of Transportation. The purpose of the plan would be to:

- Reduce, to the extent feasible, the number of vehicle (construction and other) on the roadways adjacent to the sites;
- Reduce, to the extent feasible, the interaction between construction equipment and other vehicles; and
- Promote public safety through actions aimed at driver and road safety.

The traffic management plan would include specific measures to manage traffic in the area surrounding the erosion sites and along haul routes. The plan would include specific measures to ensure the following:

- Through access for emergency vehicles shall be provided at all times.
- Access to driveways and private roads shall be maintained.
- Construction parking shall be restricted to the designated staging areas.
- A plan shall be provided for construction-generated traffic to avoid during peak periods roadway segments or intersections that are at, or approaching, a LOS that exceeds local standards.
- Traffic controls on major roads and collectors shall include flag-persons wearing safety vests and using “stop/slow” paddles to direct drivers.
- Access to public transit shall be maintained, and movement of public transit vehicles would not be impeded as a result of construction activities.
- Construction warning signs shall be posted in accordance with the local standards or those set forth in the Manual on Uniform Traffic Control Devices (FHA 2007) in advance of the construction area and at any intersection that provides access to the construction area.
- A sign, at least one square yard in size, shall be posted at all active construction sites that gives the name and telephone number or electronic mail address to contact with complaints regarding construction traffic.
- Rock, dirt, and/or other fill materials shall be prevented from being accidently dropped from trucks traveling on highways to and from the erosion sites.

Implementation of the mitigating document described above would result in a less-than-significant of any project related impacts to traffic.

4.11 Noise

This section includes a discussion of existing conditions; a summary of regulations related to noise issues; and an analysis of noise impacts of the proposed project. Where feasible, mitigation measures are recommended to reduce the level of significant impacts.

Noise impacts are analyzed on the basis of *sound.* Sound is a vibratory disturbance, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone. For the purposes of this analysis, *noise* is a sound that is loud, unpleasant, unexpected, or otherwise undesirable.

Several measurements are used to quantify sound. Measurements used in this discussion are briefly defined below.

Decibel (dB): A unitless measure of sound; describes the logarithmic ratio of a measured sound pressure level to a reference sound pressure level of 20 micropascals.

A-Weighted Decibel (dBA): An overall frequency-weighted sound level that approximates the frequency response of the human ear.

Maximum Noise Level (L_{max}): The maximum instantaneous noise level during a specific period of time. The L_{max} may also be referred to as the "peak (noise) level."

Equivalent Noise Level (L_{eq}): The instantaneous noise levels during a specific period of time in dBA are converted to relative energy values. From the sum of the relative energy values, an average energy value is calculated, which is then converted back to dBA to determine the L_{eq}.

Day-Night Noise Level (L_{dn}): The 24-hour L_{eq} with a 10 dBA "penalty" for the noise-sensitive hours between 10:00 p.m. and 6:00 a.m. The L_{dn} attempts to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal sleeping hours.

Community Noise Equivalent Level (CNEL): The CNEL is similar to the L_{dn} described above, but with an additional 4.77 dBA "penalty" for the noise-sensitive hours between 7:00 p.m. to 10:00 p.m., which are typically reserved for relaxation, conversation, reading, and television. If using the same 24-hour noise data, the CNEL is typically approximately 0.5 dBA higher than the L_{dn}.

Single Event [Impulsive] Noise Level (SEL): The SEL describes a receiver's cumulative noise exposure from a single impulsive noise event, which is defined as an acoustical event of short duration (0.5 second) and involves a change in sound pressure above some reference value (approximately 40 dB).

Sound travels uniformly outward from a point source in a spherical pattern with an attenuation rate of 6 dBA/DD (doubling of distance). As sound (noise) propagates from the source to the receptor, the attenuation is dependent upon such factors as surface characteristics, atmospheric conditions, and the presence of physical barriers. From a line source (such as a road) sound travels uniformly outward in a cylindrical pattern with an attenuation rate of 3 dBA/DD. Surface characteristics between the source and receptor may result in additional sound absorption and/or reflection.

4.11.1 Environmental Setting

The existing noise levels at the erosion sites are characterized primarily based on the intensity of vehicle and boat activity in the surrounding areas. The sites themselves do not facilitate noise generating activities. Noise sensitive uses, including residences, schools, hospitals, and elderly care facilities, which could potentially be impacted by noise generating repair activities, are located in proximity to some of the erosion sites. Table 4-17 summarizes existing noise conditions and nearby noise sensitive land uses for the thirteen erosion sites.

Table 4-17 Existing Noise Conditions and Surrounding Noise Sensitive Land Uses

Erosion Sites	Existing noise conditions	Noise sensitive land uses/approximate distance from construction area
SB16.6R	Small amount of vehicle traffic on levee, agricultural equipment	Farmstead approximately ¼ mile east-northeast
CS 21.8R	Small amount of vehicle traffic on levee, potential noise from hunting activities, farm equipment noise on agricultural land	None observed
Sac 49.7L	Small amount of vehicle traffic, some boat traffic	Residential neighborhood 150 feet north-northeast
Sac 52.3L	Small amount of vehicle traffic, some boat traffic	Residential neighborhood 100 feet north-northeast
LAR 0.3L	Interstate 5 vehicle traffic, Bercut Street vehicle traffic, some boat traffic	Located within the American River Parkway
LAR 2.8L	Adjacent industrial facility to the east-southeast.	Located within the American River Parkway
Sac 53.5R	Small amount of vehicle traffic, some boat traffic, agricultural equipment	Residential neighborhood across the river, approximately ¼ mile east
Sac 177.8R	Vehicle traffic, boat traffic and farm equipment.	None observed
Sac 16.8L	Vehicle traffic and agricultural equipment	Farmstead residence approximately ¼ mile south

Erosion Sites	Existing noise conditions	Noise sensitive land uses/approximate distance from construction area
Sac 42.7R	Vehicle traffic, some boat traffic. Located in industrial area	None observed
Sac 55.2L	Small amount of residential vehicle traffic	Residential neighborhood approximately 100 feet south
Sac 77.2L	Vehicle traffic, and farm equipment	Residential housing approximately 100 feet south
F 28.5R	Large amount of vehicle traffic over the 5th Street bridge, railroad bridge, 2nd Street, car garage near and boat traffic, airport nearby	Residential uses within100 feet

4.11.1.1 Construction Equipment Noise Levels

Point source noise would be generated by equipment associated with the proposed construction activity on the erosion sites. Table 4-18 summarizes noise levels from typical construction equipment that may be used during construction.

Table 4-18 Typical Construction Related Noise Levels

Construction Equipment	Number of Equipment Pieces	Typical Noise Level (dB) 50 feet from Source
Crane	2	82
Motor Boat	1	82
Pick-Up Truck	2	65
Tugboat	2	82

Source: Federal Transit Administration 1995, Geier & Geier Consulting 1997

4.11.2 Regulatory Setting

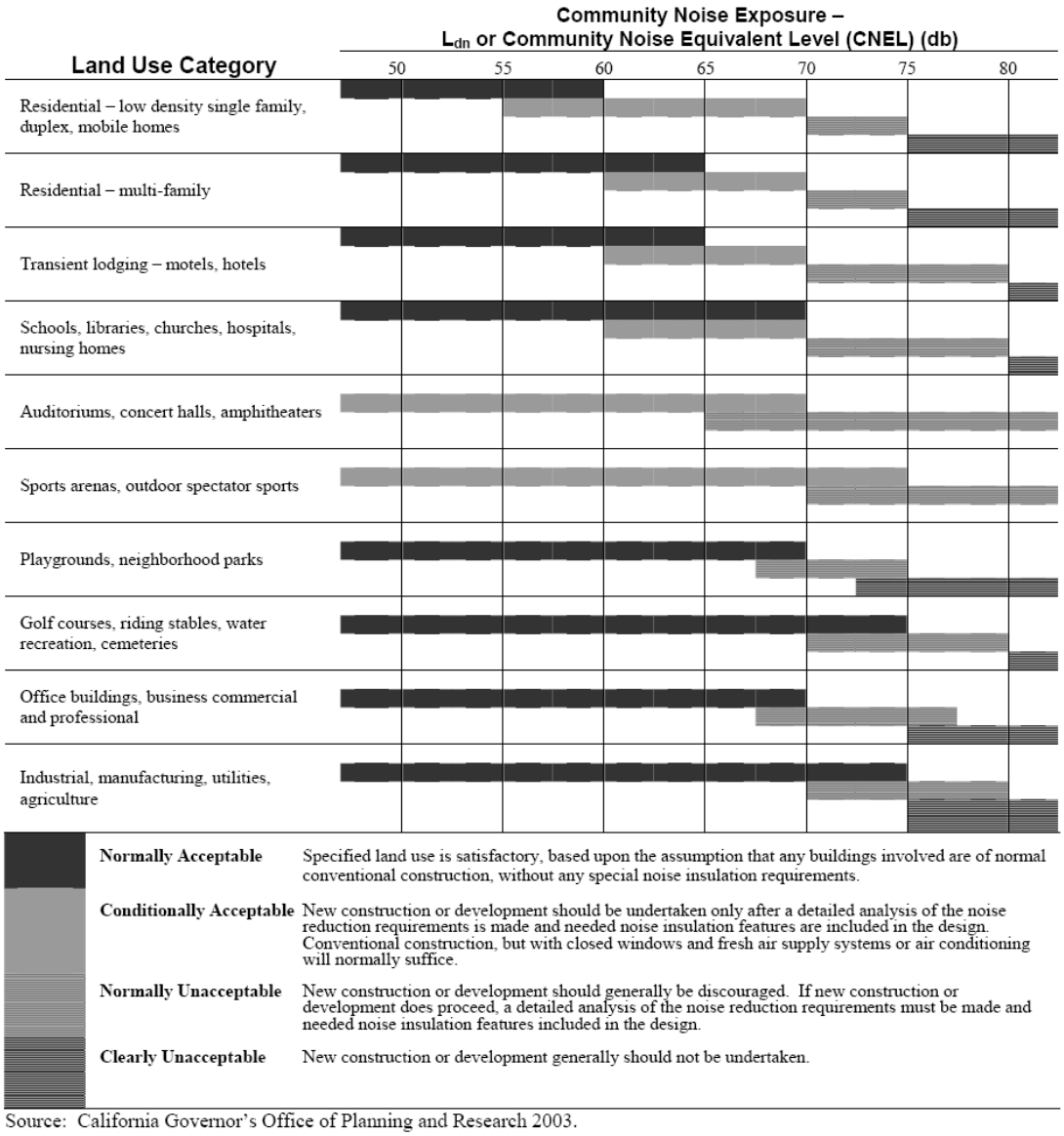
4.11.2.1 Federal and State Laws and Regulations

Code of Federal Regulations

Federal regulations establish noise limits for medium and heavy trucks (more than 4.5 tons, gross vehicle weight rating) under part 205 subpart B of the Code of Federal Regulations (CFR). The federal truck pass-by noise standard is 80 dB at 15 meters from the vehicle pathway center line.

California Code of Regulations

Title 4 of the California Code of Regulations has guidelines for evaluation of the compatibility of various land uses as a function of community noise exposure. These guide lines are listed in the table below:



Source: California Governor's Office of Planning and Research 2003.

In addition, the state of California establishes noise limits for vehicles licensed to operate on public roads. For heavy trucks, the state pass-by standard is consistent with the federal limit of 80db. The state pass-by standard for light trucks and passenger cars (less than 4.5 tons, gross vehicle rating) is also 80 dB at 15 meters form the centerline. These standards are implemented through controls on vehicle manufacturers and by legal sanctions of vehicles operators by state and local law enforcement officials.

California Health and Safety Code

The Noise Control Act, Division 28 of the California Health and Safety Code, is based upon

the understanding that all Californians are entitled to a peaceful and quiet environment, free from the intrusion of noise which may be hazardous to their health or welfare. The act established an office to develop criteria and otherwise aid local agencies in preparing noise elements (State of California 1973).

4.11.2.2 Local Laws and Regulations

Applicable local ordinances are described in the following paragraphs. Any local jurisdiction that does not have specific standards is expected to comply with state and federal laws.

American River Parkway Plan

Excessive noise in the area of the American River Parkway has the potential to adversely impact parkway visitors and wildlife. Under the plan, noise levels are considered as an element of the aesthetic quality. As a result, the American River Parkway Plan encourages policies that limit the impacts of noise associated with recreation and other uses. Specifically, noise associated with construction must be limited or mitigated to the greatest extent possible (Sacramento County 2006).

City of West Sacramento General Plan

The General Plan Noise Element states that residential hourly exterior noise levels from non-transportation noise sources may not exceed 50 dBA L_{eq} during daytime hours (between 7:00 a.m. and 10:00 p.m.) and 45 dBA L_{eq} during nighttime hours (between 10:00 p.m. and 7:00 a.m.). The maximum residential exterior noise levels from non-transportation noise sources allowed under the General Plan are 70 dBA L_{eq} during daytime hours and 65 dBA L_{eq} for nighttime hours. Residences are located approximately ¼ mile from Sac 53.5R, however these homes are located across the river and are therefore located in the City of Sacramento.

Glenn County General Plan

Title 15-560.100 of the Glenn County Code sets forth the L_{max} limits when the receiving property is zoned for commercial, residential, or industrial uses. The erosion site located in Glenn County, Sac 177.8R, and the surrounding lane are zoned both as preserve and agriculture and are not regulated under this code.

Sacramento City Code

Chapter 6.68 of the Sacramento City Code, Noise Control, establishes exterior noise standards at 55 dBA from 7 a.m. to 10 p.m. and 50 dBA from 10 p.m. to 7 a.m. for all residential land uses. Noise levels are not allowed to exceed 20 dBA above the exterior noise level standard at any time, 15 dBA above the standard for a cumulative period of 1 minute per hour, 10 dBA above the standard for a cumulative period of 5 minutes per hour, 5 dBA above the standard for 15 minutes per hour, and the standard for a cumulative period of 30 minutes per hour.

The owner or operator of a noise source which does not, or cannot, comply with the provisions of the Noise Control chapter may file an application with the zoning administrator for a variance.

Yuba City General Plan

Noise issues are directly handled by the city's Nuisance Ordinance, which regulates the time of day that certain noise generating activities are permitted to take place. According to the

general plan, F 28.5R is located within an area with allowable decibel levels ranging from 50 to 65 dB. During construction, Yuba City's General Plan allows a "conditionally acceptable" L_{dn} or CNEL up to 75 dB after an investigation and mitigation plan has been implemented to protect human health.

4.11.3 Environmental Effects

Upon completion, the proposed levee repairs are not expected to generate noise or result in a change in vehicle trips to the project sites. Construction of the proposed project would require use of heavy equipment at the construction staging areas and on each of the levee reaches. The primary effect of the proposed project would be the result of a temporary increase in the noise environment during construction activities.

These noise impacts are considered to be significant if:

- Noise levels are generated in excess of standards established by local general plans or noise ordinances, or applicable standards of other agencies;
- Excessive ground-borne vibration or noise are generated;
- A substantial permanent increase in ambient noise levels in the vicinity of the project, above levels existing without the project, results; or
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity, relative to levels existing without the project, results.

4.11.3.1 Alternative 1: Proposed Action

The proposed action would repair the erosion sites by creating a rock berm at the base of the levee and filling the remainder of the eroded slope with a soil and rock mixture. This alternative is preferred because it would not only prevent erosion, but also stabilize the levees and allow ample room for re-vegetation.

The proposed action would temporarily increase noise levels at the erosion sites. Heavy construction equipment would be used for site repair activities, including site preparation, importing rock and embankment materials, and placement of revetment materials.

Equipment typically used in construction of bank protection (bulldozers, heavy trucks, loaders, excavators, and backhoes) generate peak noise levels around 80 dB at a reference distance of 50 feet. Rock dumping may generate the highest SEL, possibly reaching 100 dB. Noise produced by these activities would be reduced over distance at an average rate of about 6 dB per doubling of distance in open landscapes. Where the existing river bank and riparian forest serve as sound barriers, they would be expected to reduce noise at nearby residences by up to an additional 15 dB. Materials hauled by trucks on the levee crown, where applicable, would typically be the source of noise and vibration having the greatest potential to disturb neighboring residents since this activity is not blocked by the levee.

Therefore, it is possible that construction activities could expose persons to noise levels in excess of established local standards, and result in increases in ambient noise levels or vibration, above those existing noise levels in the vicinity of the erosion sites. However, given that noise and vibration would be limited to daytime hours and would not subject residences to prolonged noise exposure above 55 to 65 dB (occasionally peaking at 65 dB) or

severe noise levels above 80 dB, the proposed action would not impact established communities significantly.

Upon project completion, noise generated on the erosion sites would be restored to pre-construction levels. Once the restoration plantings have established (within an estimated 5 years), the vegetation could, in many cases, serve as a barrier to significantly reduce noise impacts from recreational uses (such as boating) to surrounding communities.

Table 4-19 indicates which erosion sites could potentially exceed noise levels permitted under the applicable local ordinance.

Table 4-19 Noise Policy Jurisdiction and Compliance

Erosion Sites	Jurisdiction	Local Applicable Ordinance	Potential to exceed allowable noise levels
SB16.6R	Solano County	None	No
CS 21.8R	Solano County	None	No
Sac 49.7L	City of Sacramento	Sacramento City Code (Chapter 8.68)	Yes
Sac 52.3L	City of Sacramento	Sacramento City Code (Chapter 8.68)	Yes
LAR 0.3L	City of Sacramento	Sacramento City Code (Chapter 8.68)	No
LAR 2.8L	City of Sacramento	Sacramento City Code (Chapter 8.68)	No
Sac 53.5R	City of West Sacramento	City of West Sacramento Municipal Code (Chapter 17.32.030)	No
Sac 177.8R	Glenn County	Title 15-560.100, County Code A	No
Sac 16.8L	Sacramento County	Sacramento County Noise Ordinance (Sacramento County Code Chapter 6.68; Noise Control)	No
Sac 42.7R	Yolo County	None	No
Sac 55.2L	City of Sacramento	Sacramento City Code (Chapter 8.68)	Yes

Erosion Sites	Jurisdiction	Local Applicable Ordinance	Potential to exceed allowable noise levels
Sac 77.2L	Sutter County	None	No
F 28.5R	Yuba City	Yuba City General Plan	Yes

4.11.3.2 Alternative 2: Thin Rock Armor

This alternative would place a thin layer of rock revetment on the erosion sites. The duration of construction may be shorter than that expected under the preferred alternative, therefore reducing potential noise impacts. However, the same equipment would be required to import and place the revetment material.

These activities could temporarily expose persons to noise levels in excess of established local standards, and result in increases in ambient noise levels or vibration, above those existing noise levels in the vicinity of the erosion sites (see Table 4-20). However, given that noise and vibration would be limited to daytime hours and would not subject residences to prolonged noise exposure above 55 to 65 dB (occasionally peaking at 65 dB) or severe noise levels above 80 dB, Alternative 2 would not significantly impact established communities.

4.11.3.3 Alternative 3: No Action

The No Action Alternative would not affect noise on the levee, or conflict with any noise ordinance, plan, or regulation.

4.11.4 Mitigation

To reduce potential noise related effects on the project and surrounding area, the following mitigation measures shall be implemented:

- For sites within the City of Sacramento, an application for variance shall be filed with the zoning administrator.
- Residential areas shall be avoided when planning haul truck routes.
- To the extent feasible, the contractor shall use newer construction equipment or retrofit older equipment to make it as unobtrusive as possible (i.e. adding mufflers on engines).
- Construction timing or sequence shall be adjusted to avoid sensitive times of the day, and noise producing operations shall be combined to occur in the same time period. The total noise level produced will not be significantly greater than the level produced if the operations were performed separately.

4.12 Hazardous, Toxic, and Radioactive Waste

This section analyzes the potential for hazardous, toxic, or radioactive materials to create a significant hazard to the public through the process of the proposed levee repairs. Hazardous materials and wastes are defined by the Department of Toxic Substance Control (DTSC) as

those substances that, because of their physical, chemical, or other characteristics, may pose a risk of endangering human health or safety, or the environment (2006).

This section is based upon the findings of a Phase 1 Environmental Site Assessment completed by Parus Consulting (2008). A discussion of baseline conditions, issues of concern, and potential environmental consequences of the proposed actions is included. State, federal, and local statutes, ordinances, and policies that govern the conservation and protection of environmental resources are used in determining the potential significance of the project.

4.12.1 Environmental Setting

The SRBPP levee system consists of dredged fill deposited as a linear feature paralleling the Sacramento River and its tributaries. Initial creation of the system occurred over 100 years ago and was not heavily regulated. Therefore, it is difficult to know for certain the exact composition of the levee structure and its chemical components. The surface of the levee face differs from location to location, alternately covered with cobble, rip rap, concrete ruble, or loose soil. Topographically, the levees generally slope significantly from the crest to the river.

The erosion sites are generally used as floodwater protection zones, supporting primarily recreational uses. Possible sources of contamination include trash deposited onsite (such as leaking refrigerant from kitchen appliances), contaminate laden sediment transported in the waterway and deposited onsite, and topical application of pesticides commonly used for weed control along the levee.

The results of the Phase 1 completed for the erosion sites indicate that no recognized environmental conditions (RECs) associated with hazardous waste (as defined in ASTM Practice E1427-05) exist on the sites (ASTM 2005). Solid waste, trash, and debris observed on the sites were determined to be a *de minimis* condition.

4.12.2 Regulatory Setting

4.12.2.1 Federal and State Laws and Regulations

California Code of Regulations

Title 8 of the CCR addresses the control of hazardous substances. Section 5189 of Title 8 sets forth the Process Safety Management (PSM) standard for processes involving a highly hazardous chemical in excess of certain quantities. PSM requires a process hazard analysis, current safety information, an employee participation program, written operating procedures, a mechanical integrity program, and other procedures.

Title 8 of the CCR also contains the California Occupational Safety and Health Administration regulations for worker safety, including the storage and handling of hazardous materials. It identifies protective equipment for workers who handle hazardous materials and requirements for general facility safety.

California Government Code

Section 65962.5 of the California Government Code requires that DTSC compile and update the Cortese List of hazardous waste facilities subject to corrective action and land designated

as hazardous waste property or border zone property (CalEPA 2006).

Clean Air Act

The Clean Air Act authorizes the USEPA to set National Ambient Air Quality Standards which establish acceptable concentrations of six criteria pollutants: O_3, CO, sulfur dioxide, lead, nitrogen dioxide and fine particulate matter ($PM_{2.5}$). Refer to Section 4.10 for a complete discussion.

Clean Water Act

The CWA was designed to eliminate the release of high volumes of toxic substances to the nation's water bodies. For a complete discussion of the act, please refer to Section 4.7.

Code of Federal Regulations

Title 40 of the CFR Part 302 implements the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous materials release requirements and identifies hazardous substances, reportable quantities (RQs), and notification requirements. The National Response Center in Washington, D.C., must be notified of an accidental release of a hazardous substance in excess of an RQ. CERCLA-listed hazardous substances and RQs are listed in 40 CFR Part 302.4.

40 CFR Part 355 codifies the Emergency Planning and Community Right-to-Know Act (EPCRA) planning requirements and establishes the list of Extremely Hazardous Substances, threshold planning quantities, and emergency response planning requirements. 40 CFR Part 68, Chemical Accident Prevention Provisions, identifies regulated substances, threshold quantities (TQs), and requirements for preventing accidental releases of these substances. A Risk Management Plan is required for any processes involving regulated substances in excess of their respective TQ.

40 CFR Parts 260–272 govern the generation, transportation, treatment, storage and disposal of hazardous waste through a comprehensive management system. These regulations also list the characteristics of hazardous wastes, including ignitability, corrosivity, reactivity and toxicity. Subtitle D of these parts grants authority for regulating nonhazardous waste to the state.

Comprehensive Environmental Response, Compensation, and Liability Act

Hazardous substances are governed in part by CERCLA (1980). CERCLA created a "superfund" and provides for the clean-up and remediation of closed and abandoned hazardous waste sites.

Hazardous Materials Release Response and Inventory Program

The Hazardous Materials Release Response and Inventory Program (California Health and Safety Code Sections 25500–25520) establish business and area plans for the handling and release of hazardous materials. Basic information on the location, type, quantity, and the health risks of hazardous materials handled, used, stored, or disposed of in the state, which could be accidentally released into the environment, is tracked by the local Certified Unified Program Agency within each region for the use and awareness of hazardous materials responders, firefighters, emergency care providers, regulatory agencies and other interested persons.

The Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Water Code, §§ 13000-14958) regulates wastes that have the potential to cause loss of a beneficial use of California's waters. This act requires the RWQCB to establish reportable quantities of hazardous wastes and hazardous materials based on their potential to degrade the waters of the state. Any discharge of hazardous materials that is inconsistent with the discharge requirements of the facility must be reported to the appropriate authorities.

Resource Conservation and Recovery Act

The handling, storage, and disposal of both hazardous and non-hazardous wastes are addressed through the Resource Conservation and Recovery Act (RCRA) (42 USC 6901 et seq.) and it's implementing regulations (40 CFR Part 260 et seq.).

Safe Drinking Water and Toxic Enforcement Act

The Safe Drinking Water and Toxic Enforcement Act (Proposition 65), was enacted as a ballot initiative in November 1986. The proposition was intended by its authors to protect California citizens and the state's drinking water sources from chemicals known to cause cancer, birth defects, or other reproductive harm, and to inform citizens about exposures to such chemicals. The act requires the Governor to publish, at least annually, a list of chemicals known to the state to cause cancer or reproductive toxicity.

Superfund Amendments and Reauthorization Act

Title III of the Superfund Amendments and Reauthorization Act of 1986, also known as the EPCRA, establishes reporting requirements for businesses and facilities that store, handle, or produce significant quantities of hazardous substances. EPCRA also requires states to establish a system to inform federal, state, and local authorities of any such substances stored or handled by the regulated community.

Toxic Release Contingency Plan

The Toxic Release Contingency Plan (California Government Code Section 8574.16) requires that regional and local planning agencies incorporate within their planning the state's effort to respond to emergency toxic releases, and ensure the effective and efficient use of regional and local resources in the areas of traffic and crowd control, firefighting, hazardous materials response and cleanup, radio and communications control, and provision of medical emergency services.

4.12.2.2 Local Laws and Regulations

Local governments often have requirements that are more stringent than those set forth in federal and state regulations. These laws, regulations and policies can be found in the county's or city's General Plan, Municipal Codes, Hazardous Waste Management Plan, or other documents produced by City or County governments. Applicable regulations are discussed below.

City of West Sacramento General Plan

According to the City of West Sacramento's General Plan, the City intends to prevent loss of life, injury, and property damage due to release of hazardous materials. To accomplish this goal, the City shall regulate the storage and manufacture of flammable, explosive, or

otherwise hazardous materials and shall develop standards addressing the transport of these materials within the city.

City of West Sacramento Municipal Code

The City of West Sacramento has adopted regulations for hazardous waste in the municipal code. These regulations focus primarily on facilities known to store hazardous materials.

Sacramento County General Plan

According to the Sacramento County General Plan, Sacramento County does not impose more stringent standards or requirements on hazardous material handlers than are in state or federal law.

Solano County General Plan

Regulations included in the Solano County General Plan include time limits, disposal requirements, and labeling requirements on hazardous materials.

Sutter County Hazardous Waste Management Plan

The Sutter County Hazardous Waste Management Plan was adopted in 1990. The plan establishes a waste management hierarchy, which focuses on waste reduction and minimization.

The Sutter County Community Services Department is the local agency responsible for enforcing a variety of hazardous material and waste, requirements. The majority of the hazardous waste generated in the county (95 percent) is from small quantity generators and individual households. The predominant hazardous waste stream produced by both manifested generators and estimated for all small quantity generators in Sutter County is waste oil. As a result, Sutter County's generator programs, as recommended in the Sutter County Hazardous Waste Management Plan, focus on encouraging recycling of waste oil.

Yolo County General Plan

Yolo County's General Plan has a brief section on toxic or hazardous materials which states: "Yolo County shall develop emergency plans for implementation in the event of accident, fire, or flood involving toxic or hazardous materials."

Yuba City General Plan

Yuba City has taken several steps to provide plans for immediate responses to disasters such as hazardous materials spills. In all cases, the Sutter County Environmental Health Department shall be contacted. In addition, Yuba City has implemented policies to deal with hazardous waste, including:

- Requiring the clean-up of sites contaminated with hazardous substances.
- Requiring businesses generating hazardous waste to pay necessary costs for local implementation of programs specified in the County Hazardous Waste Management Plan, as well as the costs associated with emergency response services for a hazardous materials release.
- Specifying routes for transporting hazardous materials.

4.12.3 Environmental Effects

A Phase I was performed by Parus Consulting to identify potential sources of Environmental risk or liability in accordance with *Standard Practice for Environmental Site Assessments: Phase 1 Environmental Assessment Process* (E 1527-05) released by the American Society for Testing and Materials (ASTM) in November of 2005.

The ASTM standard defines a REC as "the presence or likely presence of any hazardous substance or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of release into the ground, ground water, or surface water of the property." The term is not intended to include *de minimis* conditions that generally do not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

No RECs were identified during the Phase 1 Environmental Site Assessment investigation performed by Parus Consulting. However, non-hazardous solid waste, trash and debris were observed on all thirteen erosion sites.

For the purpose of this analysis, effects to the environment are considered to be significant if the project would:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and/or accident conditions involving the release of hazardous materials into the environment; or
- Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment.

4.12.3.1 Alternative 1: Proposed Action

There are no RECs known on any of the erosion sites. As a result, the potential for the proposed project to create a significant hazard to the public or the environment through the upset and subsequent disposal of hazardous materials is considered minimal.

The proposed action would repair the erosion sites by creating a rock berm at the base of the levee and filling the remainder of the eroded slope with a soil and rock mixture. This alternative is preferred because it would not only prevent erosion, but also stabilize the levees and allow ample room for re-vegetation. No grading or removal of levee substrate will occur under this alternative.

Material Safety Data Sheets for all contaminants used and stored in the process of the erosion site repairs will be made available onsite. Common construction materials, such as fuels and lubricants, which can be hazardous to the environment, will also be used on the erosion sites. A potential spill of these materials would be remedied immediately following the BMPs set forth by the contractor.

4.12.3.2 Alternative 2: Thin Rock Armor

This alternative would place a thin layer of rock revetment on the erosion sites. Because there are no RECs known on any of the erosion sites and no ground disturbing activities would occur, the potential for the proposed project to create a significant hazard to the public or the environment through the upset and subsequent disposal of hazardous materials is considered minimal. However, the possibility exists that fuels, lubricants, and other construction materials could enter the human environment during construction.

4.12.3.3 Alternative 3: No Action

The No Action Alternative would not affect the potential for hazardous material and hazardous waste due to construction activities on the levee, or conflict with any hazardous waste or material policy, plan, or regulation. However, under this alternative, there is a likelihood of future levee failure. A levee failure would release possible in-situ soil contaminants on the levees themselves and also pose the potential for surface water contamination by any number of contaminants routinely used, stored, and deposited on the land side of the levee berm.

4.12.4 Mitigation

Site preparation activities shall include the removal of all non-hazardous solid waste, debris, and trash (including concrete, brick and tires) for disposal at an appropriate facility. If any undocumented hazardous waste is discovered during construction activities, construction shall stop and the proper local authorities should be notified.

Although no RECs were identified during the Phase 1 investigation, the possibility exists that fuels, lubricants and other construction materials could be released on the erosion sites during construction activities. As a result, the construction contractor shall be required to prepare a Hazardous Material Control and Response Plan prior to construction according to the Department of the Army Pamphlet 200-1, Environmental Quality, Environmental Protection and Enhancement January 17, 2002 (USACE 2002). The plan would include BMPs to (1) reduce the likelihood of spills of toxic chemicals and other hazardous materials during construction, (2) describe a specific protocol for the proper handling and disposal of materials and contingency procedures to follow in the event of an accidental spill, and (3) describe a specific protocol for the proper handling and disposal of materials should materials be encountered during construction.

In addition, a SWPPP shall be prepared to prevent possible discharge of hazardous materials into the Sacramento River system, as discussed in Section 4.7.

4.13 Socioeconomics

Environmental Justice is defined in California law (Government Code section 65040.12.e) as "the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of all environmental laws, regulations and policies." This section discusses the criteria used to determine which locations along the Sacramento River, and its tributaries are nominated for erosion repair activities, and identifies the applicable laws governing the work.

Each calendar year, a field reconnaissance review of the Sacramento River Flood Control

System is conducted by Ayres Associates for the USACE and DWR. The study provides a review of the project levees and provides an inventory of erosion sites. Including a bank erosion site in the inventory involves some judgment relative to the severity of the erosion and the threat to the levee. To be eligible for repair, the erosion sites must meet one or both of the following two criteria: (1) Bank erosion into the projection of the levee slope (also known as the 3H:1V levee prism slope), or (2) Bench (berm) width of less than 35 feet.

The sites are further evaluated based on a hazard score developed by Ayres Associates in conjunction with the USACE. Sixteen physical factors such as bank slope and seepage potential are considered in conjunction with one social parameter: an economic factor. Each category is equally weighed, so that no one factor can overwhelm the hazard score. Sites that are deemed to show the technical signs of erosion are not excluded from the repair process based upon the demographics of the area in which they occur. The erosion sites under analysis have been chosen for repair based upon the severity of the threat of a failure, based upon these criteria

4.13.1 Environmental Setting

The erosion sites proposed for repair are located in a variety of settings. Many sites are located in agricultural areas of low density land use, while others are adjacent to major population centers and homes. For a full discussion of zoning and surrounding land use, please refer to Section 4.1.1.

4.13.2 Regulatory Setting

Environmental justice is a relatively new concept that has been addressed on both the state and national level. More recently, local governments have begun to add to their guidance documents language that specifically forbids land uses that encourage segregation based on such factors as race and culture. There are no local regulations applicable to the erosion sites. Regulations that pertain to environmental justice in the areas of the erosion sites are described below.

4.13.2.1 Federal and State Laws and Regulations

The Civil Rights Act

In accordance with the Civil Rights Act of 1964, federal agencies must ensure that programs receiving federal financial assistance do not directly, through contractual or other arrangements, use criteria, methods, or practices that discriminate on the basis of race, color, or national origin.

The Dymally-Alatorre Bilingual Services Act

This act provides for effective communication between the government of the state of California and those who reside in the state, but are precluded from utilizing public services because of language barriers. The act requires that notices of public services provided by state and local government agencies are translated into the language of any significant population of non-English speaking individuals within that agency's jurisdiction.

Executive Order 12898, Environmental Justice

On February 11, 1994, President Clinton issued an "Executive Order on Federal Actions to

Address Environmental Justice in Minority Populations and Low-Income Populations" designed to focus attention on environmental and human health conditions in areas of high minority populations and low-income communities, and promote non-discrimination in programs and projects substantially affecting human health and the environment (White House 1994). The order requires the USEPA and all other federal agencies (as well as state agencies receiving federal funds) to identify these issues as they relate to their programs, policies, and activities and their potential effect on minority and/or low-income populations. The agencies are further required to develop strategies to address this issue and provide citizens access to public information regarding human health and the environment.

Executive Order 13166, Improving Access to Service to Persons with Limited English Proficiency

Signed by the president on August 11, 2000, Executive Order 13166 requires federal agencies to examine the services they provide, identify any need for services to those with limited English proficiency (LEP), and develop and implement a system to provide those services so LEP persons can have meaningful access to them.

The Sunshine Act

The Sunshine Act insures the right of citizens "to have notice of and the right to attend all meetings of agencies at which an agency business is discussed or acted upon" (PNA 2006).

United States Code

The Freedom of Information Act, Title 5 of the United States Code, Section 552, which applies only to government agencies, requires compliance with written public solicitation of information, except in the case of nine possible exemptions and three exclusions, and establishes recourse for individuals denied access to documents

Title 42 of the United States Code prohibits the denial from benefits of any federally assisted program on the basis of race, color, or natural origin (§2000d).

4.13.3 Environmental Effects

Socioeconomic impacts are considered significant if the project would:

- Induce substantial population growth in an area, either directly or indirectly;
- Foster economic or population growth, or the construction of additional housing, either directly or indirectly;
- Remove obstacles to population growth; or
- Encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively.

4.13.3.1 Alternative 1: Proposed Action

The proposed action alternative would build a berm at the toe of each erosion site and fill the upper portion of the levee slope with a rock and soil mixture. Restoration plantings would be installed as part of the repair process.

The Proposed Action is in compliance with Executive Order 12898. Project construction is confined to the bank and levee areas along the Sacramento River and its tributaries, and

would not affect any minority or low-income communities. Contractors would be hired following standard USACE procedures, and would not be disadvantaged by such factors as race or national origin. No impacts to socioeconomics will occur.

4.13.3.2 Alternative 2: Thin Rock Revetment

This alternative would cover all sites in a thin rock revetment. As with the Proposed Action, Alternative 2 is in compliance with Executive Order 12898. Project construction is confined to the bank and levee areas along the Sacramento River and its tributaries, and would not affect any minority or low-income communities. Contractors would be hired following standard USACE procedures, and would not be disadvantaged by such factors as race or national origin. No impact to socioeconomics would occur.

4.13.3.3 Alternative 3: No Action

Under the no action alternative, the erosion sites would be left, unarmored, to continue to degrade. The threat of levee failure would be amplified for the surrounding lands. Because the 13 erosion sites analyzed in this document occur in a variety of settings (from downtown Yuba City to farmlands in the Sacramento-San Joaquin Delta), no action at all of these sites would not be a significant impact to socioeconomics.

4.13.4 Mitigation

The erosion sites have been picked to undergo the proposed repairs based on a myriad of criteria designed to anticipate the threat of levee breach. Proposed design alternatives do not differ based on the zoning or other factors concerning the surrounding land uses, but only vary slightly to reflect different habitat requirements on reaches of the river.

No impact to environmental justice will occur under any of the alternatives considered. Therefore, no mitigation is required.

5. CUMULATIVE AND GROWTH INDUCING EFFECTS

5.1 Cumulative Effects

Cumulative effects of the SRBPP were described in detail in the Final EIR/SEIS IV, prepared by Jones & Stokes Associates in 1987 ongoing bank protection along the Sacramento River.

5.1.1 Land Use

The proposed erosion repairs would not have a significant impact on land use, and would not lead to any cumulative change in land use values in the areas of the sites.

5.1.2 Aesthetics

As described in Section 4.2 of this document, no significant effects on aesthetics are anticipated as a result of work on the erosion sites.

5.1.3 Recreation

As described in Section 4.3 of this document, impacts to recreation would be less-than-

significant with the implementation of the prescribed mitigation measures. The erosion sites are sufficiently spread over a geographic and demographic range to conclude that the temporary closures which will result from erosion repairs at the sites will not pose a cumulative effect to the recreational resources of any one city or county and will not be felt at the state level.

5.1.4 Cultural Resources

With the implementation of the mitigation measures described in Section 5.4 of this document, no cumulative impact to cultural resources would result from project implementation.

5.1.5 Vegetation and Wildlife

The proposed repair work will have a temporary effect on the ability of individual sites to support vegetation and wildlife. It is anticipated that most wildlife will relocate to surrounding areas until the repair work is complete and the mitigation plantings begin to provide sufficient habitat. Since the sites are spread throughout the Sacramento River and its tributaries, it is anticipated that the riparian river corridors between the sites will have the necessary capacity to absorb any displaced species until such a time as the site can be recolonized.

Section 4.5 identifies the effects of the Proposed Action on non-special-status fish. The proposed project would halt erosion and limit future natural recruitment of IWM from the existing riparian area on the bank. However, the provision of greater amounts of IWM under post-project conditions and the potential for recruitment of IWM from upstream sources suggests improved habitat conditions for non-special status fish at these sites. Because the project would implement site-specific habitat and erosion measures that benefit fisheries and aquatic habitat in the long-term, and because effects on non-special-status fish would not be considered significant, the incremental and cumulative effect of the proposed action is considered less than significant.

5.1.6 Special Status Species

Cumulative effects of the project on salmonids and delta smelt can be evaluated in terms of the net change in combined habitat value for each season and life stage modeled by the SAM. For the three sites located within Region 1a (RM 0–20; includes sites SB 16.6R, Sac 16.8L, and CS 21.8R) initial losses to all salmonid life stages during fall, winter, and spring would be recovered within two years, at the latest, of the project, with long-term gains in habitat value for these sites collectively (Table 5-1). In summer, all initial salmonid habitat losses would recover by Year 5, at the latest, followed by continued habitat value increases through the modeled time period. Combined SAM model results for delta smelt in Region 1a during winter and spring indicate recovery of all life stages would occur by Year 1 with overall long-term habitat increases. In summer, delta smelt habitat responses would exhibit initial negative values, but with net gains in habitat and recovery by Year 4 followed by continued habitat gains. Therefore, no long-term cumulative effects are expected for delta smelt spawning, incubation, or rearing at the sites located in Reach 1a as a whole during winter and spring, but would be expected during summer.

Table 5-1 Summary of combined SAM results for salmonids for three sites within Region 1a (RM 0-20; includes sites SB 16.6R, Sac 16.8L, and CS 21.8R)

Focus fish species and assessment time period	Fall			Winter			Spring			Summer		
	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt Outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration
Central Valley fall-run Chinook salmon												
All sites combined in Year 1	11	23	74		11	8	-5		53	-62		-27
All sites combined in Year 5	59	103	383		76	254	33		359	40		437
All sites combined in Year 50	157	277	649		188	526	115		528	151		662
Central Valley late fall-run Chinook salmon												

Focus fish species and assessment time period	Fall			Winter			Spring			Summer		
	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt Outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration
All sites combined in Year 1	11		74	5		8	-5	5	53			-27
All sites combined in Year 5	59		383	52		254	33	93	359			437
All sites combined in Year 50	157		649	105		526	115	233	528			662
Sacramento River winter-run and Central Valley spring-run Chinook salmon*												
All sites combined in Year 1	11	23	74	5	11	8	-5	5	53	-62	-18	
All sites combined in Year 5	59	103	383	52	76	254	33	93	359	40	105	
All sites combined in Year 50	157	277	649	105	188	526	115	233	528	151	280	
Central Valley steelhead**												
All sites combined in Year 1	36	35	61	11	18	17	-1	11	31	-94	-28	-49
All sites combined in Year 5	160	151	289	112	117	206	96	134	248	131	152	305
All sites combined in Year 50	316	363	482	218	261	386	224	305	384	309	366	489

Notes:

* No presence of Sacramento wintehttp://cbs5.com/local/sherman.island.fire.2.697968.htmlr-run Chinook salmon for smolt outmigration life stage during summer.

** Response values of adult habitat life stage are equal to adult upstream migration response values.

1. Results for each species and life stage are presented by site, season, and assessment period as calculated from time-averaged relative responses to changes in each of the six habitat variables used in the SAM (Appendix I).
2. Units are bank-line weighted relative response in feet (Appendix I).
3. See Appendix I for complete results on both bank-line weighted (shown above) and wetted-area weighted basis.

Table 5-2 Summary of combined SAM results delta smelt for three sites within Region 1a (RM 0-20; includes sites SB 16.6R, Sac 16.8L, and CS 21.8R)

Focus fish species and assessment time period	Winter		Spring		Summer	
	Spawning and incubation	Juvenile rearing	Spawning and incubation	Juvenile rearing	Spawning and incubation	Juvenile rearing
Delta smelt						
All sites combined in Year 1	31	31	41	41	-183	-183
All sites combined in Year 5	142	142	152	152	142	142
All sites combined in Year 50	172	172	170	170	216	216

Notes:

1. Results for each species and life stage are presented by site, season, and assessment period as calculated from time-averaged relative responses to changes in each of the six habitat variables used in the SAM (Appendix I).
2. Units are bank-line weighted relative response in ft (Appendix I).
3. See Appendix I for complete results on both bank-line weighted (shown above) and wetted-area weighted basis.

Table 5-3 Summary of combined SAM results salmonids for eight sites within Region 1b (RM 20–80; includes sites Sac 42.7R, 49.7L, 52.3L, 53.5R, 55.2L, 77.2L, and LAR 0.3L and 2.8L)

Focus fish	Fall	Winter	Spring	Summer

species and assessment time period	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration
Central Valley fall-run Chinook salmon												
All sites combined in Year 1	44	1			53	108	20		220	-38		
All sites combined in Year 5	127	-52			181	445	95		684	96		
All sites combined in Year 50	290	42			423	936	241		960	282		
Central Valley late fall-run Chinook salmon												
All sites combined in Year 1	44		-26	38		108	20	70				
All sites combined in Year 5	127		-202	127		445	95	254				
All sites combined in Year 50	290		-74	227		936	241	531				
Sacramento River winter-run and Central Valley spring-run Chinook salmon*												
All sites combined in Year 1	44	1	-26	38	53	108	20	70	220	-38	-62	-231
All sites combined in Year 5	127	-52	-202	127	181	445	95	254	684	96	-58	-235
All sites combined in Year 50	290	42	-74	227	423	936	241	531	960	282	59	-51

Focus fish species and assessment time period	Fall			Winter			Spring			Summer		
	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration
Central Valley steelhead**												
All sites combined in Year 1	127	-10		83	76	104	69	91	151	-1	-115	
All sites combined in Year 5	351	-104		277	253	370	265	325	480	302	-122	
All sites combined in Year 50	604	24		473	548	695	490	650	703	592	43	

Notes:

* No presence of Sacramento winter-run Chinook salmon for smolt outmigration life stage during summer.

** Response values of adult habitat life stage are equal to adult upstream migration response values.

1. Results for each species and life stage are presented by site, season, and assessment period as calculated from time-averaged relative responses to changes in each of the six habitat variables used in the SAM (Appendix I).
2. Units are bank-line weighted relative response in ft (Appendix I).
3. See Appendix I for complete results on both bank-line weighted (shown above) and wetted-area weighted basis.

Table 5-4 Summary of combined SAM results delta smelt for eight sites within Region 1b (RM 20–80; includes sites Sac 42.7R, 49.7L, 52.3L, 53.5R, 55.2L, 77.2L and LAR 0.3L and 2.8L)

Focus fish species and assessment time period	Winter		Spring		Summer	
	Spawning and incubation	Juvenile rearing	Spawning and incubation	Juvenile rearing	Spawning and incubation	Juvenile rearing
Delta smelt						
All sites combined in Year 1	265	265	276	276	-250	-250
All sites combined in Year 5	778	778	798	798	-99	-99
All sites combined in Year 50	894	894	887	887	6	6

Notes:

1. Units are bank-line weighted relative response in feet.

For the eight sites located within the Region 1b (RM 20–80; includes sites Sac 42.7R, 49.7L, 52.3L, 53.5R, 55.2L, 77.2L, and LAR 0.3L and 2.8L) combined initial habitat losses in winter and spring for all salmonid life stages would recover within 1 year, with substantial long-term gains in habitat value for these sites collectively (Table 5-3). In summer and fall, initial habitat losses for adults recover within 3 years, at the latest. However losses for juvenile salmonid life stages would not recover until Year 50, at the latest and Chinook salmon emigrating as smolts would persist throughout the 50-year modeled period.

For delta smelt life stages in Region 1b, combined SAM model results indicate that initial habitat losses in winter and spring recover immediately by Year 1, with further habitat gains through Year 50 (Table 5-4). Summer habitat losses, however, do not recover until Year 38. Considering the habitat benefits of sites with planted wetland benches in Region 1a, habitat deficits would recover to and exceed pre-project conditions by WY 2013 (Year 5) with continued positive habitat gains through the modeled time period. Although some limited delta smelt spawning, incubation and rearing may occur during summer months within Reach 1b (RM 20–80), the actual effect of these losses on delta smelt is unlikely to be substantial because delta smelt generally move farther into the delta during these months and do not typically occur upstream of RM 20 (Moyle 2002). Although reductions in the time to recovery for delta smelt from Year 5 to Year 2 may be considered for delta smelt by applying off-site compensation credits from the Cache Slough mitigation area, no long-term cumulative effects are expected for delta smelt spawning, incubation, or rearing at the eleven sites located in Region 1 taken as a whole.

Because only one site (F 28.5R) occurs within Region 2 (RM 80–143) cumulative SAM results are identical to the site-specific results (Appendix I). The proposed project would have immediate habitat benefits for all species and life stages of salmonids within the first

year after the project construction, with long-term gains in habitat over 50 years (Table 5-5).

As with Region 2 discussed above, only one site (Sacramento River RM 177.8R) occurs within Region 3 (RM 143–194) and cumulative SAM results are identical to the site-specific results (Appendix I). The proposed project would have immediate benefits in winter/spring habitat for all species and life stages of salmonids. In summer and fall, adult habitat recovers immediately by Year 1; however, low magnitude, long-term habitat losses for juvenile and smolt salmonids would not recover until Year 10 and would be followed by continued habitat gains through Year 50.

These combined habitat deficits indicate that the project could result in significant cumulative effects in Region 3 due to site-specific impacts at RM 177.8R for juvenile and smolt life stages of Chinook salmon and steelhead during summer and fall. The effect of combined summer and fall habitat losses on juvenile rearing habitat for fall-run, late fall-run and winter-run Chinook salmon, and on smolt outmigration habitat for steelhead and spring-run, fall-run, and late fall-run Chinook salmon, would likely be less than significant because the majority of the rearing period for these species and runs occurs in winter and/or spring. Project impacts to salmonids in this region are therefore likely to result in significant cumulative effects only during summer and fall for juvenile rearing Central Valley spring-run Chinook salmon, outmigrating Sacramento River winter-run Chinook salmon smolts, and Central Valley steelhead juveniles and smolts.

Table 5-5 Summary of combined SAM results for salmonids in Region 2 (RM 80-143; includes site F 28.5R)

Focus fish species and assessment time period	Fall			Winter			Spring			Summer		
	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration
Central Valley fall-run Chinook salmon												
All sites combined in Year 1	55	39			40	117	41		155	39		
All sites combined in Year 5	99	72			81	265	84		332	96		
All sites combined in Year 50	183	224			169	461	152		504	184		

Focus fish species and assessment time period	Fall			Winter			Spring			Summer		
	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration
Central Valley late fall-run Chinook salmon												
All sites combined in Year 1	55		128	40		117	41	43				
All sites combined in Year 5	99		267	76		265	84	101				
All sites combined in Year 50	183		508	116		461	152	239				
Sacramento River winter-run and Central Valley spring-run Chinook salmon*												
All sites combined in Year 1	55	39	128	40	40	117	41	43	155	39	35	117
All sites combined in Year 5	99	72	267	76	81	265	84	101	332	96	75	302
All sites combined in Year 50	183	224	508	116	169	461	152	239	504	184	228	524
Central Valley steelhead**												
All sites combined in Year 1	114	61	114	87	60	101		64	118	86	52	87
All sites combined in Year 5	205	111	218	164	120	208		145	248	200	115	236
All sites	350	298	398	243	230	339		310	383	351	304	412

Focus fish species and assessment time period	Fall			Winter			Spring			Summer		
	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration
combined in Year 50												

Notes:

* No presence of Sacramento winter-run Chinook salmon for smolt outmigration life stage during summer.

** Response values of adult habitat life stage are equal to adult upstream migration response values.

1. Results for each species and life stage are presented by site, season, and assessment period as calculated from time-averaged relative responses to changes in each of the six habitat variables used in the SAM.
2. Units are bank-line weighted relative response in feet.
3. See Appendix I for complete results on both bank-line weighted (shown above) and wetted-area weighted basis.

Table 5-6 Summary of combined SAM results for salmonids in Region 3 (includes Sac 177.8R)

Focus fish species and assessment time period	Fall			Winter			Spring			Summer		
	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration
Central Valley fall-run Chinook salmon												
All sites combined in Year 1	51	-1			23	70	52		95	51		
All sites combined in Year 5	92	-1			47	162	102		210	92		

Focus fish species and assessment time period	Fall			Winter			Spring			Summer		
	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration
All sites combined in Year 50	156	23			94	288	154		325	156		
Central Valley late fall-run Chinook salmon												
All sites combined in Year 1	51		0	51		70	52	25				
All sites combined in Year 5	92		-1	95		162	102	60				
All sites combined in Year 50	156		63	127		288	154	138				
Sacramento River winter-run and Central Valley spring-run Chinook salmon*												
All sites combined in Year 1	51	-1	0	51	23	70	52	25	95	51	-8	-51
All sites combined in Year 5	92	-1	-1	95	47	162	102	60	210	92	-3	-14
All sites combined in Year 50	156	23	63	127	94	288	154	138	325	156	22	57
Central Valley steelhead**												
All sites combined in Year 1	103	-2	0	103	37	68		40	80	102	-18	-52

Focus fish species and assessment time period	Fall			Winter			Spring			Summer		
	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration	Adult upstream migration	Juvenile rearing	Smolt outmigration
All sites combined in Year 5	185	-3	0	191	75	140		92	170	184	-8	-14
All sites combined in Year 50	295	37	69	255	139	227		193	264	295	35	63

Notes:

* No presence of Sacramento winter-run Chinook salmon for smolt outmigration life stage during summer.

** Response values of adult habitat life stage are equal to adult upstream migration response values.

1. Results for each species and life stage are presented by site, season, and assessment period as calculated from time-averaged relative responses to changes in each of the six habitat variables used in the SAM (Appendix I).
2. Units are bank-line weighted relative response in feet.
3. See Appendix I for complete results on both bank-line weighted (shown above) and wetted-area weighted basis.

The modeled values for sites in Region 1a and 2 indicate that the proposed project would be self-mitigating for salmonid juveniles and smolts immediately with habitat gains through Year 50 in all seasons. Long-term cumulative effects are not likely to be significant for any species or life-stage of salmonids. At seven of the eight sites located in Regions 1b and the only site located in Region 3, however, impacts to salmonids are likely to result in significant cumulative effects during summer and fall for juvenile rearing Central Valley spring-run Chinook salmon, outmigrant Sacramento River winter-run Chinook salmon smolts, and Central Valley steelhead juveniles (outmigration and rearing). Through the purchase of off-site compensation credits or the construction of a suitable compensation site within the first few years of project implementation, the identified impacts to summer/fall habitat may be reduced to less than significant.

Although no long-term cumulative effects are expected on the delta smelt life stages present at sites located within Region 1a during winter and spring, medium-term habitat deficits in this region and long-term habitat deficits within Region 1b for delta smelt spawning, incubation and rearing have been identified in summer. Considering all sites within Region 1a and 1b, short-term habitat deficits would recover to and exceed pre-project conditions by WY 2013 (Year 5) with continued positive habitat gains through the modeled time period.

Application of off-site mitigation credits from the Cache Slough mitigation area may be considered to reduce the time to recovery for delta smelt from Year 5 to Year 2. With the adoption of the on-site mitigation features and off-site habitat compensation, no long-term cumulative effects are expected for delta smelt spawning, incubation, or rearing at the eleven sites located in Region 1 taken as a whole.

Long-term effects of the proposed project on habitat for green sturgeon, longfin smelt and Sacramento splittail were not modeled by the SAM. However, cumulative effects on these species are expected to be generally similar to those described above for the modeled species.

Addition of IWM at Sacramento River sites upstream and inclusive of Sac 42.7L is expected to increase rearing and foraging habitat for larval and juvenile green sturgeon during winter and spring, thereby providing some long-term benefits for these life stages. Long-term reductions in summer and fall habitat for young green sturgeon would likely occur at sites where increases in riparian shade are not sufficient to compensate for the loss of in-stream structure (i.e., Regions 1b and 3). Adult green sturgeon use deep, mid-channel habitat during migration and therefore are not likely to be affected by nearshore construction activities. Potential cumulative effects on green sturgeon would therefore be limited to short-term habitat losses in summer and fall for larval and juvenile life stages, combined with effects of similar habitat losses at other SRBPP bank repair sites in the lower Sacramento River. Given the rapid recovery of the near-bank habitat conditions and the relatively long life-span of green sturgeon, these habitat losses are considered less than significant.

Although longfin smelt are estuarine and spend most of their life history within the delta in the Sacramento River estuary, long-term effects on longfin smelt are expected to be similar to results for delta smelt. Because of the extensive use of wetland benches in on-site mitigation at site Region 1a; the same long-term habitat benefits are expected for longfin smelt and any potential impacts are considered to be less than significant.

Long-term increases in nearshore cover, provided by planted aquatic vegetation on constructed wetland benches, would maintain or enhance rearing habitat for juvenile Sacramento splittail at in Regions 1b, 2, and 3. Potential long-term reductions in summer and fall habitat are not expected to have adverse effects on adult Sacramento splittail as they are not expected to be present at the erosion sites during summer or fall. Potential cumulative effects on Sacramento splittail would therefore be limited to the effects of summer and fall habitat loss for larval and juvenile life stages. Given the rapid recovery of the near-bank habitat conditions and the relatively long life-span of Sacramento splittail, these habitat losses are considered less than significant.

Effects on other special-status species by other flood control projects are expected to be less than significant since they would be regulated under Section 7 or 10 of the federal ESA or by the CDFG. These agencies would work with project proponents to compensate for their actions to a level that would reduce their effects on special-status species to less than significant.

5.1.7 Hydrology and Water Quality

Completion of the proposed project would have a nominal effect on hydrology and water quality. The BMPs proposed in conjunction with the Preferred Alternative would implement site specific mitigation consistent with the RWQCB program. This would eliminate water

quality impacts from the project. The incremental effects to hydrology and water quality from the erosion repairs would not be considerable, and would not result in a cumulative impact to water quality.

5.1.8 Geomorphology

Prior Biological Opinions have found that cumulative ecosystem-level impacts can result from multiple bank-protection actions within a given river reach (USFWS 2000). Between 1963 and 2000, the SRBPP has constructed some 152 miles of revetment between RM 0–194. This represents approximately 39% of the total bank line length of 388 miles in this reach (USFWS 2000). The approximately 8,040 feet of planned total revetment at the proposed erosion sites is an increase of approximately 2,985 feet (or 0.14%) from pre-project conditions of the SRBPP (USACE 2007a). Existing revetment at Sites SB 16.6R, LAR 2.8L, Sac 16.8L, Sac 42.7R, Sac 53.5R, Sac 55.2L, Sac 77.2L, and Sac 177.8R makes up 100% of the bank line length at each site. Based upon queries of the USACE (2007a) revetment database, existing revetment at Sites F 28.5R and Sac 49.7R make up approximately 60% to 75% of the bank line length and less than 10% of the bank line length at Sites CS 21.8R, LAR 0.3L, and Sac 52.3L, respectively.

Cumulative impacts of bank revetment within the SRBPP are primarily related to limiting bank erosion. Losses in continued bank erosion results in secondary impacts on sediment recruitment, meander migration, point bar formation and the development of off-channel water bodies like oxbow lakes and sloughs (Larsen et al. 1997, 2004; Larsen and Greco 2002). Limitation on these processes also limits IWM recruitment and future riparian forest succession by limiting point bar formation for future riparian vegetation colonization. Numerous reviews and studies over the last three decades have illustrated the key physical and biological roles IWM plays in rivers of all sizes for habitat formation, sediment and organic-matter storage, bank stability, and in maintaining a high degree of spatial heterogeneity (i.e., habitat complexity) in stream channels (Hicks et al. 1991; Reeves et al. 1991; Bisson et al. 1987, Harmon et al. 1986). Armoring banks can alter local hydraulics and thus impact channel morphology and aquatic habitat by increasing nearshore velocities and depths, promoting channel incision and channel narrowing, and increasing sediment transport (Nunally and Sotir 1994). All of the proposed site designs have carefully considered the potential for these types of hydraulic impacts.

Despite the historical legacy of the SFRCP levees and ongoing effects of bank revetment under the SRBPP, the proposed erosion sites are located adjacent to existing levees with no adjacent floodplain habitat. For this reason the long-term and cumulative effects of the project actions on floodplain habitat are considered minimal. Bank protection of the existing SRFCP levees is not expected to induce the rate of development growth on adjacent lands greater than under existing conditions. The erosion sites have been designed to avoid contributing to the cumulative impacts discussed in past Biological Opinions (NMFS 2001, USFWS 2001), with SRA cover values, in-stream structure, and riparian habitat area likely to increase with the proposed on-site mitigation features (i.e., vegetated wetland benches, planted riparian benches, anchored IWM). By implementation of these on-site mitigation measures and planned setback levees identified by these BOs and the recent Programmatic Biological Assessment (USACE 2007a), the identified cumulative effects to reach-scale

geomorphology and habitat succession may be reduced to less than significant.

5.1.9 Air Quality

As described in Section 4.9, the proposed action would result in construction-related effects on air quality due to the substantial amount of earthmoving activity involved. Alternatives to the proposed action would also generate criteria pollutants such as NO_x, ROG, PM_{10}, and CO and would contribute to current air quality violations in the same ways as the proposed action. Although these effects are considered unavoidable, because of the Sacramento Valley Air Basin's current nonattainment status, additional contributions are potentially significant, cumulative effects.

Mitigation for the proposed action consists of BMPs and the implementation of off-site mitigation including dust control, requiring the contractor to properly tune and maintain construction equipment, payment of $255,420.00 for exceedence of 17.9 tons during the construction of the project for reductions of NO_x from mobile source construction equipment, and the purchase of additional air quality credits, if necessary. Because thresholds are exceeded and mitigated by the offset of other mobile source and stationary source emitters, the incremental and cumulative effect of the proposed action is considered less than significant.

5.1.10 Traffic

To reduce construction related traffic to a less than significant level, the contractor shall be responsible for the creation and implementation of a traffic management plan, as described in Section 4.10.4. No cumulative impacts to traffic within the Central Valley are anticipated as a result of the proposed project.

5.1.11 Noise

Noise created as a result of the proposed project would not cause a cumulative impact to the noise levels of the SRBPP region.

5.1.12 Hazardous, Toxic, and Radioactive Waste

With the implementation of the BMPs described in Section 4.12.4, the proposed project would not result in a cumulative effect to hazardous, toxic, or radioactive waste.

5.1.13 Socioeconomics

As described in Section 4.13, the proposed work would not have a significant effect on socioeconomics and therefore would not contribute to any cumulative effect on socioeconomics.

5.2 Other Local Projects

5.2.1 Folsom Dam Safety and Flood Damage Reduction Action

The project, currently in the environmental review process, seeks to improve public safety downstream of Folsom Dam through modification of the dam and its appurtenant structures. Previously identified features, including, dam safety, flood damage reduction, and

hydrologic, seismic, and static issues, are addressed. Potential modification alternatives include, but are not limited to, construction of an auxiliary spillway, dam and embankment raising, seismic retrofitting of structures, and dam and embankment static options. The lead federal agency on the project is the CVFPB, with the USACE acting as a cooperating federal agency.

5.2.2 Docks Area Plan and Promenade Design

The plan includes a high-density, mixed use neighborhood with housing and retail, as well as a riverfront parkway/promenade with parks and open space. The project is located near Pioneer Bridge and west of Front Street in Sacramento. The Redevelopment Agency of the City of Sacramento is currently drafting an EIR on the project, which will include a promenade and parkway, as well as related levee improvements.

5.2.3 The Railyards

As currently planned, the project would redevelop a 240-acre Union Pacific site to a dynamic urban environment including housing, commercial, and parkway features. The site is located east of Interstate 5 and the Sacramento River. Richards Boulevard is located to the north.

5.3 Growth-Inducing Effects

The proposed repair of the levee repair sites would not directly encourage or facilitate growth. Repair of the levee sites would not remove obstacles to growth or result in subsequent population increases. All new development must be consistent with existing City and County general plan policies and zoning ordinance regarding land use, open space, conservation, flood protection, and public health and safety. In addition, all development would need to comply with applicable environmental laws and regulation and would require approval by local authorities.

5.4 Effects of the Proposed Action on Listed Species and Critical Habitat

Based on information presented in this EA, the proposed action to repair 13 erosion sites will not adversely affect any listed plant species, giant garter snake, or VELB. The proposed action is considered likely to adversely affect but not jeopardize or appreciably reduce the likelihood of either the survival or the recovery of the longfin smelt, delta smelt, green sturgeon, or the following listed salmonid ESUs:

- Central Valley spring-run Chinook salmon (threatened)
- Central Valley steelhead (threatened)
- Sacramento winter-run Chinook salmon (endangered)

Based on an evaluation of the effects of the proposed action to repair 13 erosion sites, the USACE believes the proposed action may affect but is not likely to destroy or adversely modify designated critical habitat necessary for the survival or recovery of the longfin smelt, delta smelt, Central Valley spring-run Chinook salmon, Central Valley steelhead, and Sacramento winter-run Chinook salmon. Determination of the effects of the proposed action on listed valley elderberry longhorn beetle, delta smelt, green sturgeon and salmonid ESUs is

provided in Section 5.4.1. Determination of effects of the proposed action on designated critical habitat is provided in Section 5.4.2.

5.4.1 Listed Species

Standards for determining jeopardy are set forth in Section 7(a)(2) of the ESA.

An action is said to jeopardize a species if, as a result of that action, it would reasonably be expected that the survival and recovery that species in the wild would be appreciably reduced (through reproduction, numbers, or distribution of that species), either directly or indirectly. The Proposed Action will not jeopardize the continued existence or recovery of any listed species in the project area.

Listed species may be adversely affected and formal consultation will be required. Incidental take of Sacramento River winter-run Chinook salmon, Central Valley steelhead, Central Valley spring-run Chinook salmon, delta smelt, and VELB may occur through the impairment of essential behavior patterns (e.g., feeding, escape from predators), or as a result of reductions in the quantity and quality of habitat. In addition, individuals of listed species may be killed, injured, or harassed during construction activities. Incidental take during construction activities is most likely to occur during in-water construction activities, especially if these activities extend into the fall and winter months.

5.4.1.1 Listed Terrestrial Species

The Proposed Action alternative has the potential to affect VELB directly and indirectly. There are 19 elderberry shrubs identified within the project footprints, or in the immediate vicinity, totaling 157 stems greater than 1 inch DGL. LAR 0.3L, Sac 77.7L, and F 28.5R have elderberry shrubs within their project footprints.

A 100-foot buffer shall be established around elderberry shrubs outside of the project footprint that have branches measuring 1 inch or greater DGL. Encroachment within this buffer shall be under USFWS approval. Pending approval, the shrubs shall be fenced at a distance of 20 feet. Work within this buffer area would be observed by a qualified biologist and all impacts to the shrub would be avoided to the greatest degree possible. Any impacts to the shrubs would be mitigated according to USFWS VELB conservation guidelines (USFWS 1999).

The single elderberry shrub located within the project footprint of F 28.5R will require removal to facilitate the placement of bank protection materials. In addition, the other 5 shrubs located within the footprints of the sites may potentially either require removal or be accidentally damaged in the construction process. As such, the USACE is requesting that the USFWS authorize take of these shrubs (covering up to 96 stems greater than 1 inch DGL), with transplantation to occur at a site approved by the USFWS. Until such a time as removal may be deemed necessary, mitigation for shrubs within the project footprints will be as described above.

All transplantation procedures will follow the USFWS conservation guidelines (USFWS 1999). Efforts will be made to transplant during the standard work window (September 1 through February 15), which coincides with blue elderberry shrub dormancy and is outside of the VELB flight period.

Comprehensive wildlife surveys conducted at the erosion sites have not identified any other special status terrestrial species. Should any special status species be discovered, effects will be subsequently analyzed and mitigation measures designed. Cumulative effects of the proposed project on special status terrestrial species are considered to be negligible.

5.4.1.2 Listed Fish Species

Project effects on listed fish species include alteration of the designated critical habitat of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, delta smelt, and longfin smelt. Construction effects at all erosion sites may include localized and temporary disturbance, displacement, or impairment of feeding, migration, or other essential behaviors by adult and juvenile salmon, steelhead, and green sturgeon from noise, suspended sediment, turbidity, and sediment deposition generated during in-water construction activities. These effects could also occur in areas downstream of the erosion sites, as noise and sediment may be propagated downstream. Similar effects are possible for spawning and rearing delta smelt, and longfin smelt. Accidental discharge of toxic substances during construction may cause physiological impairment or mortality of listed fish and other aquatic species at or immediately downstream of the erosion sites. The potential also exists for injury or mortality of juvenile salmonids, green sturgeon, delta smelt, and longfin smelt if individuals are unable to readily move away from channel or nearshore areas directly affected by in-water construction activities between Summer and Fall 2008 (Contracts 1 and 2 sites) and Summer and Fall 2009 (Contract 3 sites). For juveniles of those species that are able to readily move away from areas directly affected by in-water construction activities, the potential exists for indirect effects associated with increased potential for mortality due to predation in deeper habitats away from shore.

Long-term effects of the project on the habitat of listed fish species include alteration of river hydraulics, in-stream and overhead cover, and substrate conditions along the seasonal low- and high-flow shorelines of the erosion sites. Implementation of the project would result in temporary losses of riparian vegetation and in-stream cover along the summer-fall and winter-spring shorelines. However, the establishment and growth of riparian vegetation on the riparian benches and/or upper banks at all sites, and on emergent aquatic vegetation on the wetland benches (SB 16.6R, Sac 16.8L, Sac 52.3L, CS 21.8R, and F 28.5R), is expected to increase habitat values by increasing the extent of in-stream and overhead cover available to juvenile salmonids.

Based on the SAM modeling, because onsite project design features at Sac 177.8R do not fully mitigate losses of juvenile rearing and smolt outmigration outmigration during summer and fall, the Corps will purchase or develop a suitable compensation site within 50 miles of the site.

Creation of emergent wetland benches at the three sites in Region 1a (RM 0-20) and the one site in Region 1b (Sac 52.3L) would increase the amount of shallow-water habitat by adding off-channel areas suitable for spawning, incubation, and rearing by delta smelt. USFWS representatives requested that no anchored IWM would be included in project designs downstream of RM 30, which would include erosion sites SB16.6R, Sac 16.8L, and CS 21.8R. Because this decision constrained the ability for any erosion sites in this region to be constructed in a self-mitigating design for various salmonid life stages, an agreement was

reached at an Interagency Working Group (IWG) design review meeting in November 2006 (Appendix I) to allow excess anchored wood placed at sites constructed between RM 30-60 in Regions 1b—including Sac 42.7R, Sac 49.7L, Sac 52.3L, Sac 53.5R, Sac 55.2L, LAR 0.3L, and LAR 2.8L—to be used as an off-site mitigation for the delta sites.

SAM results indicate loss of summer spawning, incubation, and rearing habitat values for delta smelt at Sac 42.7R, Sac 49.7L, Sac 53.5R, Sac 55.2L, LAR 0.3L, and LAR 2.8L due to loss of shallow water habitat (i.e., steeper bank slope), coarsening of bank substrate size, and initial removal of in-stream cover during construction; these losses would not be offset by the planned installation of IWM. However, combined SAM model results for delta smelt at eight project sites in Region 1b indicate that initial habitat losses in all seasons for all modeled life stages recover by Year 1 in winter and spring, but persist through and would not recover until Year 38 in summer (Table 5-4). As stated in Section 4.6.4, habitat compensation requirements for delta smelt will be met by applying the habitat created in the Cache Slough/Yolo Bypass Mitigation Area. Although some spawning, incubation, and rearing may occur during summer, the majority of the activity periods for these life history stages occur in winter and spring, and the actual effect of these losses on delta smelt is unlikely to be substantial because delta smelt do not typically occur upstream of RM 20 (Moyle 2002). Therefore, no long-term adverse effects are expected for delta smelt spawning, incubation, or rearing at these sites. The findings for longfin smelt are the same as for delta smelt.

In consideration of the above information, the proposed action alternative is not likely to jeopardize the continued existence or recovery of these species as long as the applicable conservation measures are performed. This conclusion is based on the commitments of USACE to: (1) minimize temporary habitat losses by incorporating on-site mitigation features (e.g., riparian benches and plantings; constructed wetland benches at SB 16.6R, Sac 16.8L, Sac 52.3L, CS 21.8R, and F 28.5R; and anchored IWM and fascines at sites above RM 30, i.e., at the remaining erosion sites); and (2) offset permanent, incremental adverse effects of rock revetment on fluvial processes and associated habitat values by implementing proven conservation measures (e.g., setback levees, removal of rock revetment) at an off-site mitigation area. Concurrently implementing these conservation measures would adequately avoid, minimize, and mitigate adverse effects on the Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, delta smelt, longfin smelt and green sturgeon, and would adequately minimize or mitigate adverse effects on designated critical habitat of the winter-run Chinook salmon, spring-run Chinook salmon, steelhead, longfin smelt and delta smelt. Effects on EFH for Chinook salmon would be similarly minimized or mitigated.

Sacramento River winter-run Chinook salmon

Potential short- and long-term project effects are described below for each life stage and its habitat, including effects on designated critical habitat and EFH.

The erosion sites do not support spawning habitat for winter-run Chinook salmon. Therefore, no short- or long-term effects on spawning habitat would occur. Downstream effects on spawning habitat would not occur for winter-run Chinook salmon or any listed salmonids because spawning habitat for these species is not present downstream of the action area.

Adult winter-run Chinook salmon migrate up the Sacramento River from December through

July and use the river channel at the erosion sites as a migration pathway to upstream spawning habitat. Construction activities would not affect winter-run adults because site construction activities would not occur during the primary migration period. Additionally, construction activities would be restricted to the channel edge, and would include implementation of the avoidance and minimization measures described in Section 4.3.4.4. Long-term changes in nearshore habitat are expected to have negligible effects on adults because adult Chinook salmon generally use deep, mid-channel habitat during migration.

Rearing and emigrating juveniles and smolts may occur at the erosion sites during the fall, winter, and spring. Downstream movement of substantial numbers of juvenile winter-run Chinook salmon appears to be triggered by storm events and the resulting high flow and turbidity, with the peak outmigration period for winter-run Chinook salmon typically occurring in September through October. Despite implementing the avoidance and minimization measures, potential construction-related impacts on juveniles and smolts may occur during the August through November construction period.

Project activities may result in short-term adverse effects to juvenile and smolt winter-run Chinook salmon, their critical habitat, and EFH for this and other Chinook salmon ESUs. Construction activities that increase noise, turbidity, and suspended sediment may disrupt feeding or temporarily displace fish from preferred habitat and may make them more susceptible to predation. Rearing or outmigrating salmon may not be able to readily move away from nearshore areas directly affected by construction activities such as removal or placement of IWM and placement of rock revetment, resulting in stress, injury, or mortality. Take of juvenile or smolt winter-run Chinook salmon could therefore occur via mortality or injury during a construction activity, or by the impairment of essential behaviors such as feeding or escape from predators. Substantial increases in suspended sediment could temporarily bury substrates that support benthic macroinvertebrates, an important food source for juvenile salmonids. However, due to the limited duration and spatial extent of project activities, effects on salmonid feeding are expected to be minimal. In addition, spills or leakage of gasoline, lubricants, or other petroleum products from construction equipment or storage containers could result in physiological impairment or mortality to rearing or outmigrating salmon in the vicinity of the erosion sites. With implementation of BMPs, the potential for impacts due to spills would be minimal.

The cumulative SAM results for all 13 sites indicate that the project would result in a long-term increase in habitat values in all seasons for winter-run Chinook salmon and other salmonids at the erosion sites (Appendix I). All sites would exhibit short-term reductions in in-stream cover and shade associated with the removal or reduction of existing vegetation and IWM. At sites in Region 1b, these reductions would be offset by an immediate increase in the availability of shallow-water habitat and in-stream cover (placement of functioning IWM and fascines along 80% of the sites' lengths) following construction. Long-term increases in Chinook salmon response indices primarily reflect the positive responses of rearing juveniles and outmigrating smolts to increases in the availability of flooded vegetation on the constructed benches, as well as long-term increases in shade provided by existing and planted riparian vegetation.

At all sites, immediate reductions in area-weighted response indices occur in Year 1 for juvenile rearing and smolt outmigration habitat in summer and fall (Appendix I); these initial

deficits reflect the reduction in nearshore habitat value due to removal of riparian vegetation during construction. After Year 1, juvenile and smolt response indices exhibit a positive trend and recover to pre-project values by Year 5 at the latest due primarily to increases in cover from in-stream vegetation at sites with wetland benches (SB16.6R, Sac 16.8L, Sac 52.3L, CS21.8R, and F 28.5R), and vegetation and shade provided by existing and planted riparian vegetation at all sites.

Water quality effects to the project area would occur only during the construction period, described in Section 4.7. Potential water quality effects on winter-run Chinook salmon are discussed above under *Juvenile rearing and migration habitat*.

Central Valley spring-run Chinook salmon

Potential short- and long-term project effects are described below for each life stage and its habitat, including effects on designated critical habitat and EFH.

The erosion sites do not support spawning habitat for spring-run Chinook salmon. Therefore, no short- or long-term effects on spawning habitat would occur.

Adult spring-run Chinook salmon migrate up the Sacramento River from March through September and use the river channel at the erosion sites as a migration pathway to upstream spawning habitat. The potential for short- and long-term project effects would be similar to that described for winter-run Chinook salmon.

Like winter-run Chinook salmon, spring-run Chinook salmon typically spend up to one year rearing in fresh water before migrating to sea. Although the timing of outmigration differs somewhat between the two runs, largely due to the staggered outmigration timing of spring-run Chinook young-of-year and yearlings, rearing juvenile spring-run Chinook salmon are expected to occur at all erosion sites during the project period. The potential for short- and long-term project effects on spring-run juveniles and smolts and their critical habitat would be similar to that described for winter-run Chinook salmon.

The SAM results described above for winter-run Chinook salmon also apply to spring-run Chinook salmon.

Water quality effects to the action area would occur only during the construction period, described in Section 4.8. Potential water quality effects on spring-run Chinook salmon are discussed above under *Juvenile rearing and migration habitat*.

Central Valley steelhead

Potential short- and long-term project effects are described below for the relevant life stages and their habitat, including effects on designated critical habitat.

The erosion sites do not support spawning habitat for Central Valley steelhead. Therefore, no short- or long-term effects on spawning habitat would occur.

Adult steelhead in the Sacramento River migrate upstream during most months of the year, beginning in July, peaking in September, and continuing through February or March. Adults use the river channel at the erosion sites as a migration pathway to upstream spawning habitat, and may also use deep pools with in-stream cover as resting and holding habitat. Construction activities would affect winter-run adults because site construction activities would occur during the primary migration period. However, construction activities would be restricted to the channel edge, and would include implementation of the avoidance and

minimization measures described in Section 4.6.4. Long-term changes in nearshore habitat are expected to have negligible effects on adults because adult steelhead generally use deep, mid-channel habitat during migration.

Central Valley steelhead rear year-round in the cool upstream reaches of the mainstem Sacramento River and its major tributaries. Juveniles and smolts are most likely to occur at the erosion sites during their downstream migration to the ocean, which may begin as early as December and peaks from January to May. The importance of main channel and floodplain habitats in the lower Sacramento River to rearing steelhead is not well understood. Steelhead smolts have been found in the Yolo Bypass during the period of winter and spring inundation (Sommer 2002, pers. comm.), but the importance of this and other floodplain areas in the lower Sacramento River and upper delta is not yet clear. For purposes of this analysis, rearing juvenile steelhead are assumed to use nearshore and off-channel habitat at the erosion sites. Potential construction-related impacts on juveniles and smolts would likely occur during the August through November construction period, despite implementing the avoidance and minimization measures,

The SAM results for Central Valley steelhead (Appendix I) are similar to those for winter-run Chinook salmon, with some seasonal differences for the juvenile rearing and smolt outmigration life stages among the erosion sites. The differences in species response indices between steelhead and Chinook salmon reflect slight differences in life history timing and differences in the species' response relationships for individual habitat variables (USACE 2004). The SAM results indicate positive responses at all sites during winter and spring. The improved habitat quality stem from increases in shallow water habitat and in-stream vegetation on the wetland and riparian benches and vegetation and shade provided by existing and planted riparian vegetation.

During summer and fall, response indices are negative beginning in Year 1, due to the removal or reduction in several nearshore habitat attributes, including vegetation. These sites are located in Regions 1b and 3, which all have a riparian bench design that only offers increased habitat value when the bench is inundated during winter and spring. The sites include Sac 42.7R, Sac 49.7L, Sac 55.2L, Sac 77.2L, Sac 177.8L, LAR 0.3L, and LAR 2.8L. However, considered in the context of the project as a whole, this loss in habitat value at the impacted sites for juveniles and smolts would be offset by the immediate and long-term gains in habitat value for these life stages at the other six erosion sites, which have a wetland bench with anchored IWM design (SB16.6R, Sac 16.8L, Sac 52.3L, CS 21.8R, and F 28.5R).

Water quality effects to the action area would occur only during the construction period, described in Section 4.8. Potential water quality effects on steelhead are discussed above under *Juvenile rearing and migration habitat*.

Delta smelt

Delta smelt may be present at all sites located within Regions 1a (RM 0-20) and 1b (RM 20-80) throughout their life cycle. They are typically restricted to the delta and the lower Sacramento River downstream of RM 20, but have been documented upstream to the City of Sacramento (RM 60). Potential spawning habitat includes shallow channel edge waters in the delta and lower Sacramento River (Moyle 2002). As a result, there are potential short- and long-term project effects which include potential disruption of spawning activities, disturbance or mortality of eggs and newly hatched larvae, and alteration of spawning and

incubation habitat. Potential short- and long-term project effects are described below for each life stage of delta smelt and its habitat, including effects on designated critical habitat.

Potential short-term adverse affects to critical habitat may occur at all sites below RM 60. Disturbance or displacement may be caused by construction activities which increase noise, turbidity, and suspended sediment. Delta smelt may not be able to readily move away from channel or nearshore areas directly affected by construction activities (i.e., removal or placement of IWM, placement of rock revetment). Removal of riparian vegetation and IWM from the streambank may result in the loss of overhead and in-stream cover. Incidental take of delta smelt may occur directly from being killed or injured during a construction activity, or occur indirectly by the impairment of essential behavior patterns (i.e., feeding, escape from predators). In addition, physiological impairment may be caused by toxic substances (i.e., gasoline, lubricants, oil) entering the water.

Adult delta smelt migrate upstream between December and January and spawn between January and July, with a peak in spawning activity between April and mid-May (Moyle 2002). Project construction activities will occur between August and October 2008 (Contracts 1 and 2 sites) and August and October 2009 (Contract 3 sites). Short-term construction-related impacts on delta smelt spawning and incubation activities would therefore not likely occur during project construction.

Long-term project effects on critical habitat at the three sites in Region 1a (SB 16.6R, Sac 16.8L, and CS 21.8R) and one site in Region 1b (Sac 52.3L) indicate habitat losses for all modeled seasons and life stages immediately following project implementation, with net gains in habitat by Year 1 and overall long-term habitat increases during winter and spring (Appendix I). In summer, habitat responses at Sac 16.8L and Sac 52.3L also exhibit positive values by Year 1 followed by continued gains. Long-term habitat deficits would occur for all delta smelt life stages at SB 16.6R and CS 21.8R during summer, but would recover to pre-project conditions by Year 5 followed by continued positive habitat gains. All of four these sites have increased near-shore habitat values year-round due to the planted wetland bench with installed IWM design. With the exception of SB 16.6R and CS 21.8R during summer, no long-term adverse effects are expected for delta smelt spawning, incubation, or rearing at these sites.

SAM model results for delta smelt at seven sites in Region 1b (Sac 42.7R, Sac 49.7L, Sac 53.5R, Sac 55.2L, Sac 77.2L, LAR 0.3L, and LAR 2.8L) indicate that initial habitat losses in all seasons for all modeled life stages recover by Year 1 in winter and spring, but persist through Year 50 in summer at several sites (Appendix I). However, when offset by the positive habitat responses resulting at the four wetland bench sites, the cumulative SAM results indicate improved values in summer, with recovery to pre-project conditions by Year 5 followed by continued habitat increases through Year 50. Although some spawning, incubation, and rearing may occur during summer, the majority of the activity periods for these life history stages occurs in winter and spring. Also, the actual effect of these losses on delta smelt is unlikely to be substantial because delta smelt do not typically occur upstream of RM 20 (Moyle 2002).

Long-term project effects on delta smelt at the three sites in Region 1a and one site in Region 1b having a planted wetland bench design are expected to be beneficial. Project features, including shallow water habitat, in-stream structure, and aquatic vegetation, at the sites are

anticipated to increase habitat complexity at the summer/fall and winter/spring water surface elevations, improving conditions for delta smelt spawning. Anchored IWM at sites in Region 1b (Sac 42.7R, Sac 49.7L, Sac 52.3L, Sac 53.5R, Sac 55.2L, LAR 0.3L, and LAR 2.8L), riparian benches and riparian plantings in the project design are anticipated to increase habitat complexity at the winter/spring water surface elevations.

At the sites in Region 1a and 1b, construction of wetland benches is anticipated to increase habitat for delta smelt. However, all other sites will experience a loss of habitat values as described above. Although the proposed project would result in summer losses of shade and complex shoreline habitat at nearly all sites in Region 1b, except Sac 52.3L, the actual effect of these losses on delta smelt is unlikely to be substantial because delta smelt do not typically occur upstream of RM 20 (Moyle 2002). Although habitat compensation requirements for delta smelt will be met by applying the habitat created in the Cache Slough/Yolo Bypass Mitigation Area (Section 4.6.4), considered in the context of all erosion sites where delta smelt may occur, project effects are not expected to be significant due to the typical restricted downstream distribution of delta smelt. Furthermore, SAM results indicate that the losses in habitat value at Sac 42.7R, Sac 49.7L, Sac 53.5R, Sac 55.2L, Sac 77.2L, LAR 0.3L, and LAR 2.8L would be offset by the immediate and long-term gains in habitat value at SB 16.6R, Sac 16.8L, Sac 52.3L, and CS 21.8R.

Water quality effects to the action area would occur only during the construction period, described in Section 4.7.3. Potential water quality effects on delta smelt are discussed above under *Juvenile rearing and migration habitat*.

Longfin smelt

Determinations for longfin smelt are generally similar those for delta smelt.

Water quality effects to the action area would occur only during the construction period, described in Section 4.4. Potential water quality effects on delta smelt are discussed above under *Juvenile rearing and migration habitat*.

5.4.2 Critical Habitat

Standards for determining adverse modification or destruction of critical habitat are set forth in Section 7(a)(2) of the ESA. Destruction or adverse modification is defined (USFWS 1986) as "a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species." The USACE believes that the Proposed Action alternative will not destroy or adversely modify habitat designated as critical to any listed fish species in the project area. The 13 erosion sites do not fall within the two areas designated as critical habitat for the valley elderberry longhorn beetle.

5.4.3 Essential Fish Habitat

The project action area includes habitats that have been designated as EFH for Chinook salmon, a major contributor to Pacific Coast salmon fisheries. The Pacific Coast salmon fishery EFH extends along the Pacific Coast from Washington to Point Conception in California. Freshwater EFH includes all habitat currently and historically accessible to salmon and is based on descriptions of habitat used by coho and Chinook salmon. The EFH excludes areas above naturally occurring barriers such as waterfalls, which have been present for several hundred years, and impassible dams identified on large rivers (67 FR 2343,

January 17, 2002).

Effects of the proposed project on EFH are incorporated into the analysis for the listed and candidate species (Section 4.3.3.2). A separate analysis to address potential effects on EFH was unnecessary.

The USACE has determined that this project will adversely affect EFH for Chinook salmon at the project sites and downstream, and require a consultation under the Magnuson-Stevens Fishery Conservation and Management Act. Consultation was initiated in May 2008.

6. COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

6.1 Federal Requirements

6.1.1 Endangered Species Act

A list of threatened and endangered species with the potential to occur on or near the erosion sites was obtained from USFWS on February 29, 2008. USACE and the CVFPB have concluded that the proposed action may affect, and is likely to adversely affect, the species considered. This document will be provided to NMFS and the USFWS for a Section 7 ESA consultation, which will include evaluation of effects of the proposed project on listed and sensitive species, critical habitat, and essential fish habitat. `

Formal Section 7 consultation was initiated with NMFS and USFWS on May 8, 2008, and it is anticipated that biological opinions will be issued on, or prior to, June 8, 2008.

6.1.2 Clean Water Act

The Proposed Action alternative requires placing materials (rock revetment) in the waters of the United States. Temporary re-suspension of sediments in the nearby area is likely. A Section 401 water quality certification addressing these activities is included in Appendix J and the 404(b)(1) evaluation for the project is included as Appendix K. Contractors shall also obtain and comply with the conditions of a State General Construction Activity Stormwater Permit adopted by the California State Water Resources Control Board. The general permit is intended to ensure compliance with state water quality objectives and water protection laws and regulations, including those related to waste discharges.

The stormwater quality management program will address project construction and will specify control measures and BMPs designed to minimize sedimentation and release of products used during construction (e.g., petroleum products, paints, cements, etc.) into adjacent water bodies.

6.1.3 Clean Air Act

The project will comply with federal air quality standards, as set forth in the Clean Air Act. The project applicant will provide a plan to the local air districts demonstrating management plans to meet all applicable air standards. In addition, the USACE and CVFPB shall pay the appropriate local air quality agency an off-site mitigation fee, as necessary and per negotiations.

6.1.4 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act of 1996 governs the conservation and management of ocean fisheries. The purpose of this act is to take immediate action to conserve and manage the fishery resource off the U.S. coasts and U.S. anadromous species, and to promote the protection of EFH.

EFH is the aquatic habitat (water and substrate) necessary for fish to spawn, breed, feed, or grow to maturity (NMFS 1998) that will allow a level of production needed to support a long-term, sustainable commercial fishery and contribute to a healthy ecosystem. EFH is described for groundfish, coastal pelagic, and Pacific salmon fisheries (67 FR 2343, January 17, 2002). Important components of EFH for Chinook salmon spawning, rearing, and migration include suitable:

- substrate composition;
- water quality;
- water quantity, depth, and velocity;
- channel gradient and stability;
- food;
- cover and habitat complexity;
- space;
- access and passage; and
- habitat connectivity.

Consultation with NMFS is required for all projects with the potential to affect EFH for any species covered under the Magnuson-Stevens Fishery Conservation and Management Act. The USACE has determined that this project will adversely affect EFH for Chinook salmon at the project sites and downstream, and require a consultation under the Magnuson-Stevens Fishery Conservation and Management Act. Consultation was initiated in May 2008.

6.1.5 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act, as amended, requires consultation with the USFWS and fish and wildlife agencies of states where waters are proposed, authorized, permitted, or licensed to be impounded, diverted, or otherwise controlled by any agency under the federal permit or license. A Fish and Wildlife Coordination Act Report from USFWS is expected on June 8, 2008.

6.1.6 National Environmental Policy Act

The Draft EA/IS, issued May 8, 2008, serve as public notification of the proposed project. The Finding of No Significance completes the environmental documentation required by this Act. They will be issued on June 20, 2008 following the close of the public comment period on June 8, 2008.

6.1.7 National Historic Preservation Act

A letter was sent on May 8, 2008 to the SHPO requesting concurrence with the significance determinations set forth in this document. Pending this approval, the proposed project is in

compliance with the NHPA.

6.1.8 Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act establishes a method for providing federal protection for certain free-flowing rivers to preserve them and their immediate environments for the use and enjoyment of present and future generations. The lower American River has been designated as a Recreational River under the Wild and Scenic Rivers Act. The erosion sites located within the American River Parkway are subject to the conditions of this act. The National Parks Service, working under the United States Department of the Interior, has the jurisdiction for the determination of whether any violations occur.

6.1.9 Executive Order 11988, Flood Plain Management

This executive order requires the USACE to provide leadership and take action to avoid development in the base flood plain, reduce the hazards and risks associated with floods, minimize the effect of floods on human welfare, and restore and preserve the beneficial uses of the flood plain. The proposed action is in compliance with this executive order.

6.1.10 Executive Order 11990, Protection of Wetlands

This executive order directs the USACE to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in implementing civil works. The proposed action would not result in the long term loss of degradation of any wetlands, and is in compliance with this executive order.

6.1.11 Executive Order 12898, Environmental Justice

The proposed project would not have a disproportionally adversely effect any minority or low-income communities, and is in compliance with this executive order.

6.1.12 Farmland Protection Policy Act

This act requires a federal agency to consider the effects of its action and programs on the Nation's farmlands. The proposed action would not result in the loss of any farmland.

6.2 State of California Requirements

6.2.1 California Environmental Quality Act

This EA/IS meets the requirements of CEQA. A pubic review period will be offered to the public concurrent to the issuance of the Draft EA/IS on May 8, 2008. It is anticipated that a Negative Declaration will be signed by the CVFCB on June 20, 2008, which will complete the required CEQA documentation.

6.2.2 Clean Water Act Section 401 Certification

An application to for 401 certification was sent to the CVRWQCB on May 8, 2008.

7. FINDINGS

The Corps has reviewed and evaluated the information in this EA/IS; the SEIS/EIR IV prepared for the SRBPP; the SEIS/EIR V; other documents; and the views of other agencies, organizations, and individuals concerning the proposed bank protection work on the erosion sites along the Sacramento River, Lower American River, Feather River, Cache Slough and Steamboat Slough. The Corps has determined that the proposed bank protection work would result in no significant effects on the environment, and that the mitigation measures agreed to in the EA/IS are sufficient to substantially reduce potentially significant effects. Therefore, the preparation of a supplemental EIS is not necessary.

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